

Answers

1. Answer: d

Explanation:

Understanding Rakesh's Fixed Deposit Investment

This problem involves calculating the total amount Rakesh will receive after investing a sum of money in a fixed deposit for a specific period with compound interest. We need to find the maturity amount based on the principal, rate, and time.

Key Investment Details:

- Principal Amount (P): Rs. 10,000
- Investment Duration (n): 2 years
- Annual Interest Rate (r): 5% per annum
- Interest Type: Compound Interest

Compound Interest Calculation Explained

Compound interest means that the interest earned each year is added to the principal amount, and the next year's interest is calculated on this new, larger principal. The formula to calculate the maturity amount (A) with compound interest is:

$$A = P \times \left(1 + \frac{r}{100}\right)^n$$

Where:

- A is the amount obtained after n years, including interest.
- P is the principal amount (the initial investment).
- r is the annual rate of interest (in percent).
- n is the number of years the money is invested for.

Step-by-Step Calculation for Rakesh's Deposit

Let's apply the formula using the details from Rakesh's investment:

1. Identify the variables:

- $P = 10,000$
- $r = 5$
- $n = 2$

2. Substitute the values into the compound interest formula:

$$A = 10,000 \times \left(1 + \frac{5}{100}\right)^2$$

3. Simplify the term inside the parenthesis:

$$\frac{5}{100} = 0.05$$

$$(1 + 0.05) = 1.05$$

4. Calculate the value of $(1.05)^2$:

$$(1.05)^2 = 1.05 \times 1.05 = 1.1025$$

5. Calculate the final maturity amount (A):

$$A = 10,000 \times 1.1025$$

$$A = 11,025$$

Determining the Maturity Amount

After 2 years, Rakesh will receive a total amount of Rs. 11,025 on the maturity of his fixed deposit.

Matching the Result with Options

Now, let's compare our calculated amount with the given options:

- A. Rs. 10,000
- B. Rs. 8500
- C. Rs. 11,050
- D. Rs. 11,025

The calculated maturity amount, Rs. 11,025, matches option D.

2. Answer: c

Explanation:

Understanding the Letter Series Pattern

The primary goal is to identify the missing term in the sequence: WUT, SQP, ?, KIH, GEDA. We need to find the logical connection or pattern between these groups of letters.

Analyzing the Alphabetical Progression

To decipher the pattern, we'll examine the alphabetical position of each letter in the series and the shifts between consecutive terms.

Let's represent the letters by their position in the alphabet (A=1, B=2, ..., Z=26).

- **WUT to SQP:**
 - W (position 23) becomes S (position 19). The difference is $19 - 23 = -4$.
 - U (position 21) becomes Q (position 17). The difference is $17 - 21 = -4$.
 - T (position 20) becomes P (position 16). The difference is $16 - 20 = -4$.

This suggests a pattern of shifting each letter backward by 4 positions.

- **KIH to GEDA:**
 - K (position 11) becomes G (position 7). The difference is $7 - 11 = -4$.
 - I (position 9) becomes E (position 5). The difference is $5 - 9 = -4$.
 - H (position 8) becomes D (position 4). The difference is $4 - 8 = -4$.

This confirms the backward shift of 4 positions applies here as well for the first three letters. The last letter 'A' in GEDA doesn't perfectly fit this 3-letter pattern, suggesting a potential typo in the question's final term. However, the -4 shift is strongly indicated.

Calculating the Missing Term

We will apply the consistent pattern of a backward shift of 4 positions to the term SQP to find the missing term.

- **First Letter:** S is the 19th letter. Shifting back 4 places: $19 - 4 = 15$. The 15th letter is O.
- **Second Letter:** Q is the 17th letter. Shifting back 4 places: $17 - 4 = 13$. The 13th letter is M.
- **Third Letter:** P is the 16th letter. Shifting back 4 places: $16 - 4 = 12$. The 12th letter is L.

Combining these letters, the missing term is OML.

Verifying the Sequence with the Missing Term

Let's check if OML fits logically between SQP and KIH using the -4 shift rule.

- **SQP to OML:**
 - S (19) - 4 = 15 (O)
 - Q (17) - 4 = 13 (M)
 - P (16) - 4 = 12 (L)The transition is correct.

- **OML to KIH:**
 - O (15) - 4 = 11 (K)
 - M (13) - 4 = 9 (I)
 - L (12) - 4 = 8 (H)This transition is also correct.

The calculated term OML maintains the established pattern throughout the sequence.

Matching the Result with Options

The calculated missing term is OML. We now compare this result with the provided options:

Option Label	Term
A	LOMB
B	OML
C	MOLD
D	OLH

The term OML corresponds to Option B.

Final Answer Determination

Based on the consistent backward shift of 4 positions observed between the letters of consecutive terms in the series (WUT → SQP → OML → KIH → GED), the missing term is determined to be OML. This matches Option B.

3. Answer: a

Explanation:

Understanding the Blu-ray Disc Function

A Blu-ray Disc (often called a Blu-ray or BD) is a type of optical disc storage medium. Its primary purpose is to store large amounts of data, particularly high-definition video content and computer data.

Blu-ray Disc as a Data Storage System

The core function of a Blu-ray Disc is data storage. It uses a blue-violet laser (hence the name "Blu-ray") to read and write data. This technology allows Blu-ray Discs to store significantly more data compared to older technologies like CDs and DVDs.

Standard Blu-ray Discs can hold 25 GB of data on a single layer and 50 GB on a dual-layer disc, with higher capacity versions also available.

Analyzing the Options

Let's examine why Blu-ray Disc fits the description of a data storage system and why the other options are incorrect:

- **A. Musical Instrument:** A musical instrument is used to produce music (e.g., guitar, piano). A Blu-ray Disc is not designed for creating or playing music directly, although it can store music files.
- **B. Medical Equipment:** Medical equipment refers to devices used in healthcare for diagnosis, treatment, or monitoring (e.g., MRI machine, thermometer). Blu-ray Discs have no function as medical equipment.
- **C. Data Storage System:** This accurately describes the primary role of a Blu-ray Disc. It is a medium specifically designed for storing digital information, including movies, games, software, and backups.
- **D. Educational Kit:** An educational kit is a collection of materials or tools designed for learning purposes (e.g., science experiment kits, language learning sets). A Blu-ray Disc itself is not an educational kit, although it might contain educational content.

Conclusion on Blu-ray Disc Classification

Based on its design and intended use, a **Blu-ray Disc** functions as a high-capacity **data storage system**, utilizing optical technology to store vast amounts of digital information.

4. Answer: a

Explanation:

Analyzing Sunil's Shopping Trip

Sunil has a total budget of Rs 100. He needs to purchase four specific items: a soap, an oil bottle, a kilo of potatoes, and a chocolate. The goal is to find the combination of items from the given options that Sunil can afford within his budget.

Evaluating Purchase Options

We need to calculate the total cost for each option and check if it is less than or equal to Rs 100. We also need to ensure all required item types are included, although some options might have discrepancies in the quantity of potatoes mentioned.

Option A Evaluation

The items and their costs in Option A are:

- An oil bottle: Rs 44
- A chocolate: Rs 23
- A soap: Rs 2
- Half kg of potatoes: Rs 16

Total Cost Calculation:

Total Cost = Cost of Oil + Cost of Chocolate + Cost of Soap + Cost of Potatoes

$$\text{Total Cost}_A = 44 + 23 + 2 + 16 = 85$$

The total cost for Option A is Rs 85. This amount is within Sunil's budget of Rs 100. However, this option lists "half kg of potatoes" instead of the required "a kilo of potatoes".

Option B Evaluation

The items and their costs in Option B are:

- An oil bottle: Rs 40
- A chocolate: Rs 20
- A soap: Rs 17
- A kg of potatoes: Rs 34

Total Cost Calculation:

$$\text{Total Cost}_B = 40 + 20 + 17 + 34 = 111$$

The total cost for Option B is Rs 111. This amount exceeds Sunil's budget of Rs 100, making this option unaffordable.

Option C Evaluation

The items and their costs in Option C are:

- Half a kilo potato: Rs 12
- A soap: Rs 23
- A chocolate: Rs 5
- An oil bottle: Rs 39

Total Cost Calculation:

$$\text{Total Cost}_C = 12 + 23 + 5 + 39 = 79$$

The total cost for Option C is Rs 79. This amount is within Sunil's budget of Rs 100. Similar to Option A, this option lists "Half a kilo potato" instead of the required "a kilo of potatoes".

Option D Evaluation

The items and their costs in Option D are:

- A chocolate: Rs 50
- A soap: Rs 7
- An oil bottle: Rs 30
- A kg of potato: Rs 29

Total Cost Calculation:

$$\text{Total Cost}_D = 50 + 7 + 30 + 29 = 116$$

The total cost for Option D is Rs 116. This amount exceeds Sunil's budget of Rs 100, making this option unaffordable.

Comparing Affordable Options

Options B and D are eliminated because their total costs exceed the Rs 100 budget.

We are left with Option A (Total Cost: Rs 85) and Option C (Total Cost: Rs 79). Both options are within the budget.

The main issue is that both Option A and Option C mention purchasing "half kg" of potatoes, while the requirement is for "a kilo". Given the options, we must choose the one that best fits the criteria, even with the quantity discrepancy.

- Option A costs Rs 85.
- Option C costs Rs 79.

Option C has a lower total cost (Rs 79) compared to Option A (Rs 85), and both are within the budget. Considering the constraints and affordability, Option C represents a viable combination that Sunil could purchase, despite the description mentioning only half a kilo of potatoes.

Conclusion

Based on the analysis, Option C is the most suitable choice as it is the most affordable combination within Sunil's budget of Rs 100.

Final Answer: The final answer is

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5. Answer: d

Explanation:

Understanding Heat Exchanger Flow Types

A heat exchanger is a device designed to efficiently transfer thermal energy (heat) between two or more fluids (liquids or gases) that are at different temperatures. The way these fluids flow relative to each other significantly impacts the heat transfer efficiency. Classifying the flow arrangement is crucial for designing and analyzing heat exchangers.

The question asks to identify which option is **not** a recognized type of heat exchanger flow arrangement among the common classifications.

Common Heat Exchanger Flow Arrangements

Exploring Parallel Flow Arrangement

In a **parallel flow** arrangement, both the hot and cold fluids enter the heat exchanger at the same end and flow in the same direction. As they travel through the exchanger, the temperature difference between the fluids decreases along the length. This arrangement is simple but generally less effective in terms of heat transfer compared to counter flow.

Keywords: **Parallel flow**, heat exchanger flow.

Understanding Counter Flow Arrangement

The **counter flow** arrangement involves the hot and cold fluids entering the heat exchanger from opposite ends and flowing in opposite directions. This configuration maintains a more uniform temperature difference along the entire length of the heat exchanger, leading to the highest thermal effectiveness and efficient heat transfer compared to parallel flow.

Keywords: **Counter flow**, heat exchanger effectiveness.

Analyzing Cross Flow Arrangement

In a **cross flow** arrangement, the two fluids move at approximately right angles to each other. One fluid path is typically perpendicular to the other. This type can be further classified based on whether the fluids are mixed or unmixed as they flow across the exchanger. Cross flow designs are common in applications like air cooling or heating systems.

Keywords: **Cross flow**, fluid flow, heat transfer.

Identifying Non-Standard Flow Types

Consecutive Flow: A Misconception in Heat Exchangers

The term "**Consecutive flow**" does not represent a standard, distinct classification for heat exchanger flow arrangements in the same way that parallel, counter, and cross flow do. While a fluid might pass through multiple stages or sections sequentially within a complex heat exchanger design (which could be described as consecutive steps or passes), "consecutive flow" itself is not a fundamental flow pattern classification based on the relative direction of the fluid streams.

The standard classifications define the geometric relationship between the flow paths of the two fluids: same direction (parallel), opposite direction (counter), or perpendicular direction (cross).

Keywords: **Consecutive flow**, heat exchanger classification, flow patterns.

Final Answer Determination

Based on the standard classifications of heat exchanger flow:

- Parallel flow is a standard type.
- Counter flow is a standard type.
- Cross flow is a standard type.
- Consecutive flow is not a standard type.

Therefore, the option that is **not** a type of heat exchanger flow is Consecutive flow.

The correct option corresponds to D.

6. Answer: a

Explanation:

Gurgaon's First Women's Two-Wheeler Transport Service Identified

Ensuring safe and accessible public transportation is crucial for women's mobility in urban areas. Several initiatives have been developed over the years to cater

specifically to the needs of female commuters. This question focuses on identifying a pioneering service launched in Gurgaon.

Understanding Gurgaon's Transport Initiatives for Women

The question specifically asks for the name of the inaugural **two-wheeler public transport service** designed exclusively for **women** in **Gurgaon**. Such services aim to provide a secure and reliable commuting option, often using female drivers to enhance comfort and safety for passengers.

Identifying the Correct Service: Bikxie Pink

Based on historical records of transport services in Gurgaon, the first such initiative specifically targeting women with a two-wheeler public transport system was named **Bikxie Pink**. The name 'Pink' is often associated with services geared towards women, highlighting the service's focus demographic.

- **Bikxie Pink** was the designated name for this unique service.
- It operated as a *public transport service* using *two-wheelers*.
- The service was exclusively for *women*.
- Its launch marked a significant step in women-centric public transportation within *Gurgaon*.

Evaluating Other Options

The other options presented were:

- Bikxie Blue
- Bikxie Green
- Bikxie Red

These names were not associated with the specific launch of the first women-only two-wheeler public transport service in Gurgaon.

Therefore, the correct identification of Gurgaon's first **two-wheeler public transport service** for **all women** is **Bikxie Pink**.

7. Answer: c

Explanation:

Understanding Triangle Angles and Ratios

This problem involves finding the specific angles of a triangle when only the ratio between them is given. The ratio of the angles is provided as $2 : 3 : 5$. After finding the individual angles, we need to calculate a new ratio based on the largest and smallest angles.

Calculating Triangle Angles from Given Ratio

We know that the sum of the interior angles in any triangle is always equal to 180° . Let the angles of the triangle be $2x$, $3x$, and $5x$, based on the provided ratio $2 : 3 : 5$.

We can set up an equation to find the value of x :

$$2x + 3x + 5x = 180^\circ$$

Combine the terms involving x :

$$10x = 180^\circ$$

Now, solve for x by dividing both sides by 10:

$$x = \frac{180^\circ}{10}$$

$$x = 18^\circ$$

With the value of x , we can determine the measure of each angle:

- The smallest angle is $2x = 2 \times 18^\circ = 36^\circ$.
- The middle angle is $3x = 3 \times 18^\circ = 54^\circ$.
- The largest angle is $5x = 5 \times 18^\circ = 90^\circ$.

We can verify this by adding the angles: $36^\circ + 54^\circ + 90^\circ = 180^\circ$. The calculations are correct.

Finding the Sum of Largest and Smallest Angles

The problem requires us to find the ratio involving the largest angle and the smallest angle.

Identify the angles:

- Smallest angle = 36°
- Largest angle = 90°

Calculate the sum of the largest and smallest angles:

Sum = Largest angle + Smallest angle

$$\text{Sum} = 90^\circ + 36^\circ = 126^\circ$$

Calculating the Final Ratio

The question asks for the ratio of the sum calculated above (the sum of the largest and smallest angles) to the smallest angle itself.

Required Ratio = (Sum of largest and smallest angles) : (Smallest angle)

$$\text{Ratio} = 126^\circ : 36^\circ$$

Simplifying the Ratio

To simplify the ratio $126 : 36$, we look for the greatest common divisor (GCD) for both numbers.

We can simplify in steps:

- Both numbers are even, so divide by 2: $126 \div 2 = 63$ and $36 \div 2 = 18$. The ratio becomes $63 : 18$.
- Notice that the sum of digits for 63 ($6 + 3 = 9$) and 18 ($1 + 8 = 9$) are both divisible by 9. So, divide both numbers by 9: $63 \div 9 = 7$ and $18 \div 9 = 2$.

The simplified ratio is $7 : 2$.

Matching the Result with Options

The final calculated ratio is 7 : 2. Let's compare this with the options provided:

- Option A: 7 : 2
- Option B: 2 : 3
- Option C: 7 : 1
- Option D: 3 : 5

Our result, 7 : 2, matches Option A.

8. Answer: a

Explanation:

India's First Mars Orbit Effort Explained

This question asks about the specific attempt number when the **first Indian spacecraft** successfully entered the **orbit of Mars**. India's journey to Mars was a significant milestone in space exploration.

Understanding the Mars Orbiter Mission (MOM)

India's historic mission to Mars, known as the Mars Orbiter Mission (MOM) or Mangalyaan, was undertaken by the Indian Space Research Organisation (ISRO).

- The primary goal was to study the Martian surface and atmosphere and to test technologies required for an interplanetary mission.
- Mangalyaan was launched on November 5, 2013.
- It successfully entered the orbit of Mars on September 24, 2014.

Analyzing the Attempt Number

Crucially, the Mars Orbiter Mission was India's very **first attempt** at an interplanetary mission. Space agencies often require multiple attempts to achieve orbit insertion

around another planet due to the complex calculations and trajectory adjustments needed. However, ISRO's Mars Orbiter Mission achieved this complex feat on its **first** try, making it a remarkable success.

Therefore, the first Indian spacecraft entered the orbit of Mars in its **First** effort.

Matching the Effort to the Options

Reviewing the options provided:

- A. First
- B. Second
- C. Third
- D. Fourth

Based on the mission's success, the correct option corresponds to the **First** attempt.

Conclusion: India's successful Mars orbital insertion was achieved on the mission's inaugural interplanetary voyage, marking it as a **first** attempt success.

9. Answer: d

Explanation:

Divisibility Problem: Finding $(X - Y)$ for Number 732XY

Understanding the Divisibility Condition

The problem asks us to find the value of the expression $(X - Y)$ when the five-digit number 732XY is divisible by 70. The number 732XY represents a number where X is the tens digit and Y is the units digit.

Applying Divisibility Rules

For a number to be divisible by 70, it must be divisible by both 7 and 10, since 7 and 10 are coprime factors of 70 ($70 = 7 \times 10$).

Divisibility by 10

A number is divisible by 10 if its units digit is 0. In the number $732XY$, the units digit is Y . Therefore, for $732XY$ to be divisible by 10, Y must be 0.

So, the number becomes $732X0$. Now we know $Y = 0$. The expression we need to find is $(X - 0)$, which simplifies to just X .

Divisibility by 7

Now, the number $732X0$ must also be divisible by 7. We can check this using the divisibility rule for 7, or by direct division.

Let's use the divisibility rule approach. A common method involves checking the divisibility of the number formed by the first few digits.

Consider the number $732X0$. We need to determine the value of X (which can be any digit from 0 to 9) such that $732X0$ is divisible by 7.

We can divide 732 by 7 to see the remainder:

$$732 \div 7$$

- $700 \div 7 = 100$
- $32 \div 7 = 4$ with a remainder of 4.

$$\text{So, } 732 = (7 \times 104) + 4.$$

Now, let's look at the number $732X0$. This can be written as $73200 + 10X$.

Let's find the remainder when 73200 is divided by 7.

$$73200 = 732 \times 100 = ((7 \times 104) + 4) \times 100$$

$$73200 = (7 \times 104 \times 100) + (4 \times 100)$$

$$73200 = (7 \times 10400) + 400$$

Since 7×10400 is divisible by 7, the remainder of 73200 when divided by 7 is the same as the remainder of 400 when divided by 7.

$400 \div 7$:

- $350 \div 7 = 50$
- $400 - 350 = 50$
- $50 \div 7 = 7$ with a remainder of 1.

So, $400 = (7 \times 57) + 1$. The remainder is 1.

Therefore, 73200 has a remainder of 1 when divided by 7.

Now, the number $732X0$ can be written as $73200 + 10X$. For $732X0$ to be divisible by 7, the remainder of $73200 + 10X$ when divided by 7 must be 0.

This means $(1 + (10X \pmod{7}))$ must be divisible by 7.

Let's find the remainder of $10X$ when divided by 7.

- $10 \pmod{7} = 3$.
- So, $10X \pmod{7} = (3X \pmod{7})$.

We need $(1 + 3X)$ to be divisible by 7. Let's test values of X from 0 to 9:

- If $X = 0$, $1 + 3(0) = 1$ (Not divisible by 7)
- If $X = 1$, $1 + 3(1) = 4$ (Not divisible by 7)
- If $X = 2$, $1 + 3(2) = 1 + 6 = 7$ (**Divisible by 7**)
- If $X = 3$, $1 + 3(3) = 1 + 9 = 10$ (Not divisible by 7)
- If $X = 4$, $1 + 3(4) = 1 + 12 = 13$ (Not divisible by 7)
- If $X = 5$, $1 + 3(5) = 1 + 15 = 16$ (Not divisible by 7)
- If $X = 6$, $1 + 3(6) = 1 + 18 = 19$ (Not divisible by 7)
- If $X = 7$, $1 + 3(7) = 1 + 21 = 22$ (Not divisible by 7)
- If $X = 8$, $1 + 3(8) = 1 + 24 = 25$ (Not divisible by 7)
- If $X = 9$, $1 + 3(9) = 1 + 27 = 28$ (**Divisible by 7**)

So, the possible values for X are 2 and 9.

Calculating the Value of $(X - Y)$

We found that $Y = 0$. The possible values for X are 2 and 9.

Let's calculate $(X - Y)$ for both possibilities:

- Case 1: If $X = 2$ and $Y = 0$, then $(X - Y) = 2 - 0 = 2$.
- Case 2: If $X = 9$ and $Y = 0$, then $(X - Y) = 9 - 0 = 9$.

The options provided are A. 2, B. 5, C. 6, D. 3. The value 9 is not among the options.

The value 2 is present as option A.

Therefore, the required value of $(X - Y)$ is 2.

Final Answer Verification

If $X = 2$ and $Y = 0$, the number is 73220. Let's check if 73220 is divisible by 70.

$$73220 \div 70 = 7322 \div 7 = 1046.$$

Since the division results in a whole number, 73220 is indeed divisible by 70. The value of $(X - Y)$ is $2 - 0 = 2$. This matches option A.

10. Answer: a

Explanation:

IRENA Headquarters Location Explained

This section clarifies the location of the headquarters for the International Renewable Energy Agency (IRENA), a significant international organization focused on renewable energy.

What is the International Renewable Energy Agency (IRENA)?

The International Renewable Energy Agency (IRENA) is a global intergovernmental organization that supports countries in their transition to a sustainable energy future. It serves as a key hub for international cooperation, providing practical support, policy advice, and data on renewable energy technologies and implementation. IRENA's work is crucial in promoting the widespread adoption and sustainable use of all forms of renewable energy, including energy efficiency.

Identifying the Headquarters of IRENA

Choosing the location for an international organization's headquarters involves various factors, including strategic importance, commitment to the organization's goals, and facilities. For IRENA, the selection process led to a specific city.

- The International Renewable Energy Agency (IRENA) has its official headquarters established in **Abu Dhabi**, United Arab Emirates.
- This decision was finalized following a selection process where Abu Dhabi was chosen over other candidate cities.
- Abu Dhabi was selected as the host city in 2009, and the agency officially began its operations from there.
- The choice of Abu Dhabi reflects the host country's commitment to promoting renewable energy and sustainable development.

Significance of Abu Dhabi as IRENA Headquarters

Establishing the headquarters in **Abu Dhabi** positions IRENA within a region actively investing in and promoting renewable energy initiatives. The UAE's strategic location and its focus on diversifying its energy mix contribute to IRENA's global outreach and effectiveness in fostering international collaboration on sustainable energy solutions.

11. Answer: b

Explanation:

This question requires us to modify a given mathematical expression by interchanging specific mathematical signs and then evaluate the resulting expression. Let's break down the process step-by-step to find the correct value.

Interchanging Mathematical Signs

The original expression is given as: $20 \times 7 + 15 - 21 \times 105 \div 95$

The instruction is to interchange the signs '-' and '÷'. This means wherever we see a '-' sign, we replace it with '÷', and wherever we see an '÷' sign, we replace it with a '-' sign.

Applying this interchange to the original expression:

- The '+' sign remains unchanged.
- The '-' sign between 15 and 21 becomes '÷'.
- The '÷' sign between 105 and 95 becomes '-'.

The new expression after interchanging the signs is:

$$20 \times 7 + 15 \div 21 \times 105 - 95$$

Evaluating the New Expression

To evaluate the modified expression, we must follow the standard order of operations, often remembered by the acronym BODMAS or PEMDAS:

- Brackets / Parentheses
- Orders / Exponents
- Division and Multiplication (performed from left to right)
- Addition and Subtraction (performed from left to right)

The expression to evaluate is: $20 \times 7 + 15 \div 21 \times 105 - 95$

Step 1: Perform Division

First, we handle the division operation: $15 \div 21$.

$$\frac{15}{21} = \frac{3 \times 5}{3 \times 7} = \frac{5}{7}$$

The expression now becomes:

$$20 \times 7 + \frac{5}{7} \times 105 - 95$$

Step 2: Perform Multiplication

Next, we perform the multiplication operations from left to right:

- $20 \times 7 = 140$
- $\frac{5}{7} \times 105 = \frac{5 \times 105}{7} = 5 \times 15 = 75$

Substitute these values back into the expression:

$$140 + 75 - 95$$

Step 3: Perform Addition

Now, perform the addition:

$$140 + 75 = 215$$

The expression simplifies to:

$$215 - 95$$

Step 4: Perform Subtraction

Finally, perform the subtraction:

$$215 - 95 = 120$$

Conclusion

After interchanging the '-' and '÷' signs and evaluating the expression using the order of operations, the resulting value is 120.

Comparing this value with the given options:

- A. 135
- B. 120
- C. 180

- D. 140

The calculated value matches option B.

12. Answer: b

Explanation:

Understanding the Family Relationships

This question requires us to determine the relationship between two individuals, P and S, based on a description of their family connections. We need to carefully follow the links in the family tree as described.

The key pieces of information given are:

- P is the mother of Q.
- Q is the sister of R.
- S is the son of R.

Step-by-Step Deduction of Relationships

Let's break down the relationships step by step:

- **P and Q:** We are told "P is mother of Q". This tells us that P is female and is the parent of Q.
- **Q, R, and P:** We know "Q is sister of R". This means Q and R are siblings. Since P is the mother of Q, she must also be the mother of her sibling, R. So, P is the mother of R.
- **R and S:** We are told "S is the son of R". This means R is the parent of S, and S is male.

Combining these facts, we have established that P is the mother of R, and R is the parent of S.

Determining the Specific Relationship between P and S

Based on the deduced facts:

- P is the mother of R.
- R is the parent of S.

The parent of one's parent is their grandparent. Therefore, P is the grandparent of S.

More specifically, since P is the *mother* of R (S's parent), P is S's grandmother.

Evaluating the Given Options

Now let's look at the options provided and see which one fits:

- **Option A: Maternal Grandmother**
For P to be the *maternal* grandmother, R (S's parent) would need to be female (P's daughter). However, the problem statement does not specify the gender of R. R could be male or female. If R is male, P would be the paternal grandmother, not the maternal grandmother. Since R's gender is unknown, we cannot definitively conclude P is the *maternal* grandmother.
- **Option B: Mother**
P is the mother of Q and R, not the mother of S. So, this is incorrect.
- **Option C: Mother-in-law**
This relationship implies marriage, which is not mentioned in the problem description. So, this is incorrect.
- **Option D: Cannot be determined**
As explained for Option A, while we know P is the grandmother of S, we cannot be certain if she is the *maternal* grandmother because the gender of R is not provided. Given that "Maternal Grandmother" is a specific option, and this specific detail cannot be confirmed, the relationship cannot be determined *with the specificity required by Option A*. Therefore, this option is the most appropriate choice.

Conclusion on P's Relationship to S

The provided information establishes P as the grandmother of S. However, the option "Maternal Grandmother" requires knowing the gender of R, which is not given. Because the specific type of grandmother (maternal) cannot be confirmed from the information, the correct conclusion is that the relationship cannot be determined from the given choices.

13. Answer: a

Explanation:

Understanding the Tree and Shadow Problem

This question asks us to find the angle of elevation. We are given the **height of the tree** and the **length of its shade**. We can model this situation using a right-angled triangle where:

- The height of the tree is the side opposite to the angle of elevation.
- The length of the shade is the side adjacent to the angle of elevation.
- The angle of elevation is the angle at the ground looking up to the top of the tree.

Applying Trigonometry to Find the Elevation Angle

The relationship between an angle in a right-angled triangle and the lengths of the opposite and adjacent sides is given by the tangent function.

The formula is:

$$\tan(\theta) = \frac{\text{Opposite}}{\text{Adjacent}}$$

Here:

- θ represents the angle of elevation we need to find.

Calculating the Elevation Angle

We are given the following values:

- Height of the tree (Opposite side) = $16\sqrt{3}$ m
- Length of the shade (Adjacent side) = 16 m

Let's substitute these values into the tangent formula:

$$\tan(\theta) = \frac{16\sqrt{3}}{16}$$

Now, we simplify the expression:

$$\tan(\theta) = \sqrt{3}$$

To find the angle θ , we need to identify the angle whose tangent is $\sqrt{3}$. We know the standard trigonometric values:

$$\tan(30^\circ) = \frac{1}{\sqrt{3}}$$

$$\tan(45^\circ) = 1$$

$$\tan(60^\circ) = \sqrt{3}$$

By comparing our result $\tan(\theta) = \sqrt{3}$ with the known values, we can conclude that:

$$\theta = 60^\circ$$

Conclusion

Therefore, the elevation angle when the height of the tree is $16\sqrt{3}$ m and the length of its shade is 16 m is **60 degrees**.

14. Answer: d

Explanation:

Champaran: Gandhi's First Satyagraha in India

This explanation details Mahatma Gandhi's pivotal role in the Indian independence movement, focusing on his initial successful campaign using the satyagraha method.

Understanding Mahatma Gandhi's Satyagraha

Satyagraha, a term coined by Mahatma Gandhi, translates to 'truth force' or 'holding firmly to truth'. It is a philosophy and practice of non-violent resistance and civil disobedience aimed at achieving political or social change. Gandhi first introduced this method on a large scale in **India** during the struggle for independence.

Champaran Satyagraha: The Beginning

- **When:** The **Champaran Satyagraha** occurred in 1917 in the Champaran district of Bihar.
- **Why:** It was launched against the exploitative "tinkathia" system imposed by European landlords (planters) on local farmers. This system compelled farmers to cultivate indigo on 3/20th (or 'teen kathia') of their land and sell it at unremunerative prices.
- **Gandhi's Involvement:** Gandhi was invited by local peasants to investigate their plight. Despite being ordered by the authorities to leave the region, Gandhi refused, famously stating, "I must say that nothing I could have done would be of greater service to India than to identify myself with this struggle..." He was arrested but released, and the government eventually formed a committee with him as a member.
- **Success:** The campaign involved peaceful protests, demonstrations, and non-cooperation. It led to the repeal of the tinkathia system and substantial concessions for the farmers. This marked Gandhi's **first successful satyagraha** experiment in **India**, proving the effectiveness of his non-violent approach.

Evaluating Other Options

To confirm **Champaran** as the **first successful satyagraha**, let's look at the other options:

- **Kheda:** The Kheda Satyagraha in Gujarat took place in 1918. It focused on demanding tax remission for farmers affected by crop failure. While successful and significant, it occurred after Champaran.
- **Bardoli:** The Bardoli Satyagraha, famous for Sardar Patel's leadership, happened in 1928. It was a major peasant movement but occurred much later than Champaran.
- **Salt March (Dandi March):** This iconic event, a direct challenge to British salt monopoly and tax, took place in 1930. It was a large-scale civil disobedience movement but chronologically followed Champaran.

Therefore, the evidence clearly points to the **Champaran Satyagraha** as Mahatma Gandhi's **first successful satyagraha in India**.

15. Answer: c

Explanation:

Understanding Computer 'Online' Status and Connectivity

The term '**online**' in the context of computers and networks refers to a device or system being connected to a network, typically the internet, and being operational or available for use. It signifies a state of active connection and accessibility.

Defining the 'Online' State in Computing

When a computer or device is '**online**', it means it is:

- Connected to a wider network, such as the internet or a local area network (LAN).
- Able to communicate with other devices or servers on that network.
- Often implies the system is functional and ready to perform tasks or provide services that require network access.

Analyzing the Options Related to 'Online'

Let's examine each option to determine which one does *not* align with the meaning of being 'online':

- **Option A: Connectivity status in the network**
This is a fundamental aspect of being 'online'. Being connected to a network is precisely what defines the 'online' state.
- **Option B: Connectivity status in a non-functional unit**
This option describes a situation where a unit is connected but not working correctly. The term 'online' usually implies functionality. A device that is part of a **non-functional unit** cannot actively participate in network operations or provide services, even if physically connected. Therefore, describing its **connectivity status** as simply 'online' might be misleading or inaccurate, as the unit isn't performing its intended function. This is likely the concept that 'online' does not mean.
- **Option C: A situation where transactions can be done in real-time**
Being 'online' enables real-time activities, such as instant messaging, online banking, or e-commerce transactions. This is a common characteristic and benefit of being 'online'.
- **Option D: Remote server access**
Accessing resources or services hosted on servers located elsewhere (**remote server access**) is a primary function facilitated by being 'online' and connected to the internet.

Conclusion on 'Online' Definition

Based on the analysis, the state of being 'online' fundamentally relates to being connected and functional within a network environment, enabling real-time interactions and remote access. The concept that deviates from this is the **connectivity status of a non-functional unit**, as 'online' typically assumes a degree of operational capability.

16. Answer: c

Explanation:

Understanding Vitamin A and Its Chemical Identity

The question asks to identify the substance directly related to Vitamin A among the given options. Vitamin A is a crucial fat-soluble vitamin essential for various bodily functions, including vision, immune system function, reproduction, and cellular communication. It exists in several forms, but key related compounds are often discussed in biochemistry and nutrition.

Exploring the Options Related to Vitamin A

Let's analyze each option to determine its relationship with Vitamin A:

- **Vitamin A Overview:** Vitamin A is a group of compounds that includes retinol, retinal, retinoic acid, and provitamin A carotenoids (like beta-carotene). The most common and biologically active form often referred to when discussing Vitamin A is retinol.
- **Option A: Cobalamin**
 - Cobalamin is the chemical name for Vitamin B12.
 - Vitamin B12 is a water-soluble vitamin belonging to the B complex group, vital for nerve function, DNA synthesis, and red blood cell formation.
 - It is distinct from Vitamin A and its related compounds.
- **Option B: Retinol**
 - Retinol is an organic compound belonging to the fat-soluble vitamin A family.
 - It is considered the alcohol form of Vitamin A and is one of the most biologically active forms.
 - The body converts retinol into other active forms like retinal and retinoic acid, which perform specific functions.
 - Therefore, Retinol is directly related to Vitamin A, often being used synonymously or representing its primary active form.
- **Option C: Ascorbic acid**
 - Ascorbic acid is the chemical name for Vitamin C.

- Vitamin C is a water-soluble vitamin known for its antioxidant properties and role in collagen synthesis and immune function.
- It is entirely different from Vitamin A.
- **Option D: Amino acid**
 - Amino acids are molecules that serve as the building blocks of proteins.
 - While essential for health, they are structurally and functionally different from vitamins like Vitamin A.

Conclusion on Vitamin A's Relation

Based on the analysis, **Retinol** is the chemical compound that represents a primary form of Vitamin A. The other options, Cobalamin (Vitamin B12), Ascorbic acid (Vitamin C), and Amino acids, are distinct nutrients or biomolecules. Therefore, the substance most directly related to Vitamin A among the choices is Retinol.

17. Answer: a

Explanation:

Credit Card Swiping: The Role of Electromagnetic Induction

When you swipe a credit card through a card reader, the information stored on the card's magnetic stripe is read and transmitted to the payment terminal. This process relies on a fundamental physics principle. Let's explore how it works and why **Electromagnetic Induction** is the correct answer.

The Magnetic Stripe and Card Reader

- **Magnetic Stripe:** The back of your credit card has a dark stripe, known as a magnetic stripe or magstripe. This stripe contains your account information, encoded in tiny magnetic particles. These particles are aligned in specific patterns to represent binary data (0s and 1s).

- **Card Reader:** The slot you swipe your card through contains a read/write head. This head has a tiny coil of wire wrapped around an iron core, essentially acting as an electromagnet.

Understanding Electromagnetic Induction

Electromagnetic Induction is the production of an electromotive force (voltage) across an electrical conductor in a circuit due to its exposure to a changing magnetic field. This phenomenon is famously described by Faraday's Law of Induction. In simpler terms, when a magnet moves relative to a conductor, or when the magnetic field's strength changes around a conductor, a voltage is induced in that conductor.

Faraday's Law mathematically expresses this relationship:

$$\mathcal{E} = -N \frac{d\Phi_B}{dt}$$

Here:

- $\mathcal{E}$ represents the induced electromotive force (voltage).
- N is the number of turns in the coil (part of the reader head).
- $\frac{d\Phi_B}{dt}$ signifies the rate at which the magnetic flux (Φ_B) changes over time (t).

The core idea relevant here is that a changing magnetic field generates a voltage.

How Swiping Works via Induction

Here's a step-by-step breakdown of the process:

1. **Card Movement:** As you physically swipe the credit card, the magnetic stripe moves across the read/write head located inside the card reader slot.
2. **Changing Magnetic Field:** The magnetic stripe holds data encoded as varying magnetic patterns. When the card is swiped, these different magnetic patterns pass sequentially over the coil within the reader's head. This causes the magnetic field experienced by the coil to change continuously.
3. **Voltage Induction:** According to the principle of **Electromagnetic Induction**, this constantly changing magnetic field passing through the coil induces a varying

electrical voltage (a signal) across the coil.

4. **Data Decoding:** The electronic circuitry within the card reader detects these fluctuations in voltage. By interpreting the pattern of these voltage signals, the reader translates the magnetic information back into the original digital data (like your card number, name, and expiration date).
5. **Data Transmission:** Finally, this decoded information is sent from the card reader to the payment terminal and then processed for the transaction.

Thus, the core mechanism that allows data retrieval from the magnetic stripe is **Electromagnetic Induction**.

Evaluating Other Options

It's important to understand why the other options are not the correct principle:

- **B. Frictional Force:** While friction occurs during the physical act of swiping, it's the resistance to motion between the card stripe and the reader. Friction itself does not read or transmit the stored data; it's merely a consequence of the movement involved.
- **C. Photoelectric Effect:** This principle relates to the emission of electrons from a material when light shines on it. It involves light energy converting into electrical energy and has no connection to the magnetic storage or reading process used in credit cards.
- **D. Dynamic Technology:** This is a broad and non-specific term. While the swiping action is "dynamic" (meaning involving movement or change), the term itself doesn't explain the underlying scientific principle. **Electromagnetic Induction** is the specific physical law that governs how the data is read.

Therefore, the process of reading data from a credit card's magnetic stripe when swiped is fundamentally based on the principle of **Electromagnetic Induction**.

18. Answer: c

Explanation:

Understanding the World Series Cup Organization

The question asks about the original organizer of the World Series Cup in the format of One Day International (ODI) cricket. This event was a significant part of cricket history, introducing many innovations.

Examining the Options for World Series Cup Organizer

Let's look at the choices provided:

- **A. Australian Cricket Board:** While the Australian Cricket Board (now Cricket Australia) was involved in cricket administration in Australia, they were not the original organizers of the controversial World Series Cricket.
- **B. International Cricket Conference:** The International Cricket Conference (ICC) is the global governing body for cricket, but it did not organize the initial World Series Cup.
- **C. Kerry Francis Bullmore Packer:** Kerry Packer, through his company Packer Communications, was the driving force behind World Series Cricket (WSC), which ran from 1977 to 1979. WSC included major tournaments and matches that became precursors to modern ODI spectacles, often referred to colloquially in relation to the "World Series Cup".
- **D. Test and Country Cricket Board:** This board primarily governed cricket in England and was not involved in the organization of the World Series Cup in Australia.

Identifying the Correct Organizer: Kerry Packer's Role

The World Series Cricket (WSC) was a groundbreaking, privately financed alternative cricket competition organized by Australian media tycoon Kerry Packer. The primary goal was to gain broadcast rights for cricket, which the Australian Broadcasting Commission had previously held. WSC introduced many features that are standard in ODIs today, such as coloured clothing, playing under lights with a white ball, and player salaries significantly higher than those offered by official cricket boards.

Therefore, Kerry Francis Bullmore Packer is recognized as the originator and organizer of this influential cricket series.

Conclusion on World Series Cup Organization

Based on the historical context of World Series Cricket, Kerry Packer was the individual responsible for its organization and the subsequent impact it had on the ODI format.

19. Answer: a

Explanation:

Rearranging Cluttered Letters to Find the Odd Word

The goal here is to take sets of jumbled letters, rearrange them into **meaningful words**, and then determine which word is different from the others based on a common characteristic or theme.

Decoding the Jumbled Letter Sets

Let's unscramble each group of letters provided:

- **A. ACETR:** These letters can be rearranged to form words like **CRATE**, **RACE**, **REACT**, or **CATER**.
- **B. UETSTN:** Rearranging these letters can yield words such as **TUNES**, **STENT**, **NEST**, or **TEST**.
- **C. YIBLRR:** From these letters, a plausible word is **RIB**.
- **D. KRTMAE:** These letters can be rearranged perfectly to form the word **MARKET**.

Often, these puzzles hint at a specific context. Considering the words derived (CRATE, TUNES, RIB, MARKET), it's challenging to find a clear commonality that excludes only one. However, if we consider common intended words in such puzzles, Options B and C might relate to education (**STUDENTS** and **LIBRARY** respectively, though the letters provided don't perfectly match). Option A could conceptually relate to education too (like **TEACHER**). If this educational context is implied, we can compare it to Option D.

Identifying the Different Word

Let's analyze the potential categories, assuming a common theme related to education:

- **Education/Learning Context:** Words like **STUDENTS** (people learning), **LIBRARY** (place of knowledge), and potentially words related to teaching (like **TEACHER**) are often associated with education. Options B, C, and potentially A could fit into this theme if we consider the intended words behind the jumbled letters.
- **Commerce Context:** The word **MARKET**, derived from KRTMAE, clearly relates to commerce, trade, and business activities.

By comparing these categories, we can see that **MARKET** stands apart.

- Options A, B, and C (based on potential intended words like **TEACHER**, **STUDENTS**, **LIBRARY**) are strongly linked to the theme of **education**.
- Option D, **MARKET**, relates to **commerce**.

Therefore, **MARKET** is the word that is different because its theme (commerce) does not align with the likely intended theme (education) of the other options.

Conclusion

The rearrangement of the letters **KRTMAE** results in the word **MARKET**. This word is identified as the different one because it falls under the category of commerce, while the other options likely represent words associated with education.

The correct option is **D**.

20. Answer: a

Explanation:

India's Government Formation 2009–2014

The period between 2009 and 2014 in India saw the formation and continuation of a specific type of government based on the results of the 2009 general elections.

The 2009 elections led to the victory of the United Progressive Alliance (UPA). The Indian National Congress (INC) was the leading party within the UPA. While the INC emerged as the single largest party, it did not secure an absolute majority of seats required to form the government independently.

Explaining Coalition Government

A **coalition government** is formed when a single political party does not win enough seats to have a majority in the legislature. To govern, this party must join forces with one or more other political parties. These allied parties then collectively form a majority and share power.

In the case of India between 2009 and 2014:

- The Indian National Congress (INC), leading the UPA, needed support from other parties to reach the majority mark.
- Key allies included parties like the Nationalist Congress Party (NCP), Dravida Munnetra Kazhagam (DMK), and others, which formally joined the UPA coalition.
- This arrangement, where multiple parties combined to form the government, is the definition of a **coalition government**.

Evaluating Incorrect Government Types

Let's consider why the other options are not the correct description for India's government during 2009–2014:

- **Single party government:** This type of government occurs when one party wins a clear majority of seats on its own. The INC did not achieve this in the 2009 elections, making this option incorrect.
- **All party government:** This implies participation from most or all political parties, often formed during national emergencies or for specific purposes of national unity. The government formed in 2009 was specific to the UPA alliance and did not include all parties, hence it was not an 'all party government'.

- **राष्ट्रीय सरकार (Rashtriya Sarkar / National Government):** While sometimes used loosely, this term often refers to a broader national unity government or an all-party government. The specific structure in 2009–2014 was a pre-electoral alliance (UPA) that won and formed a government with its coalition partners, making 'coalition government' the most accurate and standard political science term.

Therefore, the most accurate description of the government in India during the period 2009–2014 is a **coalition government**.

21. Answer: d

Explanation:

Evaluating the Trigonometric Expression $\tan(24^\circ) \cdot \tan(48^\circ) \cdot \tan(42^\circ) \cdot \tan(66^\circ)$

This problem requires finding the value of a product of four tangent functions. We can solve this by using fundamental trigonometric identities, specifically focusing on complementary angles.

Applying Complementary Angle Identities

We need to evaluate the expression:

$$E = \tan(24^\circ) \cdot \tan(48^\circ) \cdot \tan(42^\circ) \cdot \tan(66^\circ)$$

Recall the complementary angle identity for tangent:

$$\tan(90^\circ - \theta) = \cot(\theta)$$

We also know that the cotangent is the reciprocal of the tangent:

$$\cot(\theta) = \frac{1}{\tan(\theta)}$$

Combining these, we get:

$$\tan(90^\circ - \theta) = \frac{1}{\tan(\theta)}$$

Or equivalently:

$$\tan(\theta) \cdot \tan(90^\circ - \theta) = 1$$

Step-by-step Calculation

Let's rearrange the terms in the expression to group angles that add up to 90° :

- $24^\circ + 66^\circ = 90^\circ$
- $48^\circ + 42^\circ = 90^\circ$

So, we can rewrite the expression E as:

$$E = (\tan(24^\circ) \cdot \tan(66^\circ)) \cdot (\tan(48^\circ) \cdot \tan(42^\circ))$$

Now, apply the complementary angle identity:

- For the first pair: $\tan(66^\circ) = \tan(90^\circ - 24^\circ) = \cot(24^\circ)$.
- For the second pair: $\tan(42^\circ) = \tan(90^\circ - 48^\circ) = \cot(48^\circ)$.

Substitute these back into the expression:

$$E = (\tan(24^\circ) \cdot \cot(24^\circ)) \cdot (\tan(48^\circ) \cdot \cot(48^\circ))$$

Using the identity $\tan(\theta) \cdot \cot(\theta) = 1$:

- $\tan(24^\circ) \cdot \cot(24^\circ) = 1$
- $\tan(48^\circ) \cdot \cot(48^\circ) = 1$

Therefore, the expression simplifies to:

$$E = (1) \cdot (1) \quad E = 1$$

Conclusion

By skillfully applying the complementary angle identity for tangent, we found that the value of the given expression $\tan(24^\circ) \cdot \tan(48^\circ) \cdot \tan(42^\circ) \cdot \tan(66^\circ)$ is **1**.

22. Answer: c

Explanation:

Prime Minister's Climate Change Council Composition

This question asks about the specific number of members who make up the Prime Minister's Climate Change Council. Understanding the structure of key governmental bodies is important for topics related to climate policy and environmental governance.

Determining the Council Size

The Prime Minister's Climate Change Council is a significant advisory body. To answer the question accurately, we need to know the official number of members designated for this council. Let's review the options provided:

- A. 13 members
- B. 5 members
- C. 18 members
- D. 8 members

Based on the structure and composition of the Prime Minister's Climate Change Council, it is established to have **18 members**. This number reflects the council's mandate to bring together diverse expertise and perspectives on climate change matters.

Conclusion on Council Membership

Therefore, the correct option reflecting the number of members in the Prime Minister's Climate Change Council is C.

23. Answer: c

Explanation:

Given:

Ratio of the age of Seema and Reema = 2 : 3

Concept used:

The ratio $a : b$ shows a/b

Where,

Antecedent = a

Consequent = b

Calculation:

Let the present age of Seema be $2x$

Let the present age of Reema be $3x$

$$3x - 2x = 6$$

$$\Rightarrow x = 6$$

$$\Rightarrow \text{Present age of Seema} = 2 \times 6 = 12$$

$$\Rightarrow \text{Present age of Reema} = 3 \times 6 = 18$$

$$\text{After six years age of Seema} = 12 + 6 = 18$$

$$\text{After six years age of Reema} = 18 + 6 = 24$$

$$\Rightarrow \text{The ratio of Seema and Reema after six years} = 18 : 24 = 3 : 4$$

$\therefore$ The ratio of age of Seema and Reema after six years is 3 : 4.

24. Answer: d

Explanation:

The correct answer is Spiral.

- Shape of Milky way is Spiral.

★ Key Points

- Our Sun is a star and all the planets around it are part of a galaxy known as the Milky Way Galaxy.
- A galaxy is a large group of stars, gas, and dust bound together by gravity.
- They come in a variety of shapes and sizes.
- **The Milky Way is a large barred spiral galaxy.** All the stars we see in the night sky are in our own Milky Way Galaxy.
- The first clue to the shape of the Milky Way comes from the bright band of stars that stretches across the sky .
- This band of stars can be seen with the naked eye in places with dark night skies. That band comes from seeing the disk of stars that forms the Milky Way from inside the disk, and tells us that our galaxy is basically flat.

★ Important Points

- Our galaxy is called the Milky Way because it appears as a milky band of light in the sky when you see it in a really dark area.

25. Answer: c

Explanation:

Impact of Excess Calcium Oxalate in the Body

This section explains the health condition resulting from excessive amounts of calcium oxalate in the body. Calcium oxalate is a chemical compound, and its concentration within the body can influence health outcomes.

Understanding Calcium Oxalate Formation

Calcium oxalate is a salt formed from calcium and oxalate. While it's a natural compound found in the body and certain foods (like spinach, rhubarb, and nuts), problems arise when its levels become too high. Normally, the kidneys filter waste products, including oxalate, and excrete them from the body in urine. However, when there's an **excessive amount of calcium oxalate**, it can lead to health issues.

Mechanism of Stone Development

High concentrations of calcium oxalate in bodily fluids, particularly urine, can cause the compound to crystallize. Here's how it happens:

- **Supersaturation:** When the levels of calcium and oxalate in urine exceed their solubility limit, the urine becomes supersaturated.
- **Crystal Formation:** In this supersaturated state, calcium oxalate molecules start to bind together, forming tiny crystals.
- **Crystal Aggregation:** These initial crystals can then stick to each other and to the kidney lining.
- **Stone Growth:** Over time, more crystals deposit onto these aggregates, causing them to grow larger and eventually forming solid masses known as stones. These are most commonly found in the kidneys (kidney stones) but can form elsewhere too.

Therefore, an **excessive amount of calcium oxalate** directly contributes to the formation of **stones**.

Analysis of Other Options

Let's look at why the other options are not the direct consequence of excess calcium oxalate:

- **Bronchitis:** This condition involves inflammation of the bronchial tubes in the lungs. It is typically caused by infections (viral or bacterial) or environmental irritants (like smoke or pollution), not by calcium oxalate levels.

- **Diabetes:** Diabetes is a metabolic disorder characterized by high blood sugar levels, resulting from problems with insulin production or function. Its causes are related to glucose metabolism and are unrelated to calcium oxalate accumulation.
- **Meningitis:** This is an inflammation of the meninges, the membranes surrounding the brain and spinal cord. It is usually caused by bacterial or viral infections, and not associated with excess calcium oxalate in the body.

Conclusion on Calcium Oxalate Effects

Based on the physiological process, the accumulation of an **excessive amount of calcium oxalate** in the body primarily leads to the formation of **stones**, particularly kidney stones.

26. Answer: b

Explanation:

Total naturalist = 100

15 want to see only butterflies, 30 want to see only birds

⇒ Remaining naturalist = $(100 - 30 - 15) = 55$

10 want to see both bees and butterflies, 20 want to see both birds and bees, 5 want to see both bees and bats and the rest of the people only want to see bats.

People want to see only bat is $55 - (10 + 20 + 5)$

⇒ 20

∴ The number of naturalists who only want to see bats is 20

27. Answer: b

Explanation:

Solving the Naturalist Group Ratio Question

This explanation breaks down how to find the ratio between naturalists interested in seeing only bats and those interested in seeing only butterflies, based on the provided group information.

Understanding the Naturalist Groups

We are given information about a group of 100 naturalists and their preferences for seeing certain animals. Let's list the details provided:

- Total number of naturalists: 100
- Naturalists wanting to see only butterflies: 15
- Naturalists wanting to see only birds: 30
- Naturalists wanting to see both bees and butterflies: 10
- Naturalists wanting to see both birds and bees: 20
- Naturalists wanting to see both bees and bats: 5
- The remaining naturalists want to see only bats.

The key is to first determine the number of naturalists in the 'only bats' category.

Calculating Naturalists Interested in Only Bats

To find the number of naturalists who want to see **only bats**, we need to sum up all the specified groups and subtract this sum from the total number of naturalists.

The groups explicitly mentioned, excluding the 'only bats' category, are:

- Only butterflies: 15
- Only birds: 30
- Bees and butterflies: 10
- Birds and bees: 20

- Bees and bats: 5

Let's calculate the sum of these known groups:

$$\text{Sum of known groups} = 15 + 30 + 10 + 20 + 5$$

$$\text{Sum of known groups} = 80$$

Now, we can find the number of naturalists who want to see only bats. Let N_{total} be the total naturalists and N_{known} be the sum of the known groups.

$$\text{Number of naturalists wanting to see only bats} = N_{total} - N_{known}$$

$$\text{Number of naturalists wanting to see only bats} = 100 - 80$$

$$\text{Number of naturalists wanting to see only bats} = 20$$

Determining the Ratio of Naturalists

The question asks for the ratio of naturalists who want to see **only bats** to those who want to see **only butterflies**.

We have calculated:

- Number of naturalists wanting to see only bats = 20
- Number of naturalists wanting to see only butterflies = 15 (given directly)

The required ratio is:

$$\text{Ratio} = (\text{Number of naturalists wanting to see only bats}) : (\text{Number of naturalists wanting to see only butterflies})$$

$$\text{Ratio} = 20 : 15$$

To simplify the ratio, we find the greatest common divisor (GCD) of 20 and 15, which is 5. We divide both parts of the ratio by 5:

$$\text{Simplified Ratio} = \frac{20 \div 5}{15 \div 5}$$

$$\text{Simplified Ratio} = \frac{4}{3}$$

So, the ratio is 4 : 3.

Comparing this result with the given options:

- A. 3 : 4
- B. 2 : 3
- C. 4 : 3
- D. 3 : 2

The calculated ratio 4 : 3 matches option C.

28. Answer: b

Explanation:

This problem involves analyzing the preferences of 100 naturalists for different species: Butterflies, Birds, Bees, and Bats. We need to find out how many naturalists are interested in viewing at least two of these species.

Understanding Naturalist Group Preferences

Let's break down the information given:

- Total number of naturalists = 100.
- Naturalists who want to see **only** butterflies = 15.
- Naturalists who want to see **only** birds = 30.
- Naturalists who want to see both bees and butterflies = 10.
- Naturalists who want to see both birds and bees = 20.
- Naturalists who want to see both bees and bats = 5.
- The remaining naturalists want to see **only** bats.

Calculating the Number of 'Only Bats' Preferrers

To find the number of naturalists who prefer only bats, we first sum the counts of all the other specified groups. The structure of the question suggests these groups are

distinct:

Sum of specified groups = (Only Butterflies) + (Only Birds) + (Bees and Butterflies) + (Birds and Bees) + (Bees and Bats)

$$\text{Sum} = 15 + 30 + 10 + 20 + 5 = 80$$

The number of naturalists who prefer only bats is the total number of naturalists minus this sum:

$$\text{Number of 'Only Bats' naturalists} = 100 - 80 = 20$$

Identifying Naturalists Interested in Multiple Species

The question asks for the number of naturalists who want to see **at least two** of the four species. This includes those interested in exactly two species, exactly three species, or all four species.

Based on the information and the calculation for "the rest", we can infer that the group of 100 naturalists is divided into the following distinct categories:

- Only Butterflies: 15
- Only Birds: 30
- Bees and Butterflies (implies exactly these two, given the structure): 10
- Birds and Bees (implies exactly these two): 20
- Bees and Bats (implies exactly these two): 5
- Only Bats: 20

Let's check if these categories sum up to the total:

$$15 + 30 + 10 + 20 + 5 + 20 = 100. \text{ This confirms our understanding of the distribution.}$$

The naturalists who want to see **at least two** species are those mentioned in the categories involving pairs:

- Bees and Butterflies: 10
- Birds and Bees: 20
- Bees and Bats: 5

Summing these counts gives the total number of naturalists interested in at least two species:

Total (At least two species) = (Bees and Butterflies) + (Birds and Bees) + (Bees and Bats)

Total = $10 + 20 + 5 = 35$

Conclusion on Naturalist Preferences

The groups consisting of naturalists who prefer only one species are: Only Butterflies (15), Only Birds (30), and Only Bats (20). The sum is $15 + 30 + 20 = 65$.

The remaining naturalists, numbering 35, fall into categories involving preferences for two species (Bees & Butterflies, Birds & Bees, Bees & Bats). Since no information is given about preferences for three or four species, and the partitioning accounts for all 100 naturalists, these 35 individuals represent everyone interested in at least two species.

Therefore, 35 naturalists want to see at least two of the four species.

29. Answer: a

Explanation:

Discovering the First Bank in India

Understanding the history of banking in India involves recognizing the pioneering institutions that laid the foundation for the modern financial system. The question asks us to identify the **first bank** established in the country.

The Establishment of the Bank of Hindustan

The institution widely recognized as the **first bank in India** was the **Bank of Hindustan**. It was established in the year 1770.

Key facts about the Bank of Hindustan:

- Founded: 1770
- Location: Calcutta (now Kolkata)
- Significance: Marked the beginning of modern banking operations in India. Although it no longer operates, its founding date makes it historically significant as the first.

Analysis of Other Options

Let's examine the other banks mentioned in the options to understand why they are not considered the first:

- **Reserve Bank of India (RBI):** The RBI was established much later, on April 1, 1935. It functions as India's central bank, responsible for monetary policy and regulating the banking system. It was certainly not the first bank.
- **State Bank of India (SBI):** The origins of the SBI can be traced back to the Bank of Calcutta established in 1806, which later merged to become the Imperial Bank of India in 1921. The SBI was formed after the nationalization of the Imperial Bank in 1955. While SBI has a long lineage, it is not the first bank founded in India.
- **Central Bank of India:** This bank was established in 1911. While it is one of the oldest existing banks in India, it was founded significantly after the Bank of Hindustan.

Conclusion on the First Indian Bank

Based on historical timelines, the **Bank of Hindustan**, founded in 1770, holds the title of the **first bank in India**.

30. Answer: c

Explanation:

Finding the Average of Cubic Terms x^3 and $1/x^3$

This solution explains how to find the average of x^3 and $\frac{1}{x^3}$ when the average of x and $\frac{1}{x}$ is given as P . We will use algebraic manipulation and a common algebraic identity to solve this problem.

Understanding the Given Information

- We are given that the average of x and $\frac{1}{x}$ is P .
- The average is calculated by summing the terms and dividing by the number of terms (which is 2 in this case).
- So, we can write the given information as:

$$\frac{x + \frac{1}{x}}{2} = P$$

- Multiplying both sides by 2, we get the sum of x and $\frac{1}{x}$:

$$x + \frac{1}{x} = 2P$$

- It's important to note the condition $x \neq 0$, which ensures that $\frac{1}{x}$ and $\frac{1}{x^3}$ are defined.

Calculating the Sum $x^3 + 1/x^3$

Our goal is to find the average of x^3 and $\frac{1}{x^3}$, which is $\frac{x^3 + \frac{1}{x^3}}{2}$. To do this, we first need to find the value of the sum $x^3 + \frac{1}{x^3}$.

We can use the algebraic identity for the cube of a binomial sum:

$$(a + b)^3 = a^3 + b^3 + 3ab(a + b)$$

Let $a = x$ and $b = \frac{1}{x}$. Substituting these into the identity:

$$\left(x + \frac{1}{x}\right)^3 = x^3 + \left(\frac{1}{x}\right)^3 + 3(x)\left(\frac{1}{x}\right)\left(x + \frac{1}{x}\right)$$

Simplifying the equation:

$$\left(x + \frac{1}{x}\right)^3 = x^3 + \frac{1}{x^3} + 3(1)\left(x + \frac{1}{x}\right)$$

$$\left(x + \frac{1}{x}\right)^3 = x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right)$$

Now, we substitute the value $x + \frac{1}{x} = 2P$ into this equation:

$$(2P)^3 = x^3 + \frac{1}{x^3} + 3(2P)$$

Calculate the terms:

$$8P^3 = x^3 + \frac{1}{x^3} + 6P$$

To find the sum $x^3 + \frac{1}{x^3}$, rearrange the equation:

$$x^3 + \frac{1}{x^3} = 8P^3 - 6P$$

Determining the Average of x^3 and $1/x^3$

Now that we have the sum $x^3 + \frac{1}{x^3}$, we can find the average by dividing the sum by 2:

$$\text{Average} = \frac{x^3 + \frac{1}{x^3}}{2}$$

Substitute the expression we found for the sum:

$$\text{Average} = \frac{8P^3 - 6P}{2}$$

Factor out 2 from the numerator and simplify:

$$\text{Average} = \frac{2(4P^3 - 3P)}{2}$$

$$\text{Average} = 4P^3 - 3P$$

Conclusion

Therefore, the average of x^3 and $\frac{1}{x^3}$ is $4P^3 - 3P$. This matches one of the options provided.

31. Answer: d

Explanation:

Finding the Value of the Expression from the Quadratic Equation

The problem asks us to find the value of the expression $(x - \frac{1}{x})^2$ given a specific quadratic equation: $5x^2 - 6x - 5 = 0$.

Analysis of the Given Quadratic Equation

We are given the equation:

$$5x^2 - 6x - 5 = 0$$

Our goal is to find the value of $(x - \frac{1}{x})^2$. To do this, we first need to find the value of $x - \frac{1}{x}$.

Manipulating the Equation

Let's manipulate the given quadratic equation to help us find the required value. We can divide the entire equation by x , assuming $x \neq 0$.

First, let's check if x can be zero. If we substitute $x = 0$ into the equation $5x^2 - 6x - 5 = 0$, we get $5(0)^2 - 6(0) - 5 = -5$. Since $-5 \neq 0$, x cannot be zero, so dividing by x is a valid step.

Dividing the equation $5x^2 - 6x - 5 = 0$ by x :

$$\frac{5x^2}{x} - \frac{6x}{x} - \frac{5}{x} = \frac{0}{x}$$

This simplifies to:

$$\left(5x - 6 - \frac{5}{x} = 0 \right)$$

Calculating $x - \frac{1}{x}$

Now, we rearrange the terms to isolate the expression involving x and $\frac{1}{x}$:

Add 6 to both sides:

$$\left(5x - \frac{5}{x} = 6 \right)$$

Factor out 5 from the terms on the left side:

$$\left(5 \left(x - \frac{1}{x} \right) = 6 \right)$$

Divide both sides by 5 to find the **value** of $x - \frac{1}{x}$:

$$\left(x - \frac{1}{x} = \frac{6}{5} \right)$$

Calculating the Final Expression Value

We need to find the **value** of $\left(x - \frac{1}{x}\right)^2$. Now that we know $x - \frac{1}{x} = \frac{6}{5}$, we can substitute this value:

$$\left(\left(x - \frac{1}{x} \right)^2 = \left(\frac{6}{5} \right)^2 \right)$$

Squaring the fraction:

$$\left(\left(\frac{6}{5} \right)^2 = \frac{6^2}{5^2} = \frac{36}{25} \right)$$

Therefore, the value of the expression $\left(x - \frac{1}{x}\right)^2$ is $\frac{36}{25}$.

Conclusion

Comparing our result with the given options, the correct value matches option 4.

- Option 1: $\frac{16}{25}$
- Option 2: $\frac{64}{25}$
- Option 3: $\frac{81}{25}$
- **Option 4: $\frac{36}{25}$**
- Option 5:

32. Answer: a

Explanation:

This solution explains the typical materials used in the manufacturing of contact lenses, focusing on why certain materials are preferred.

Contact Lens Material Properties

Contact lenses are thin, curved lenses placed directly on the surface of the eye (the cornea). For safe and comfortable wear, the material must possess specific properties:

- **Oxygen Permeability:** The lens must allow oxygen from the air to pass through to the cornea.
- **Water Content:** Adequate moisture helps keep the lens comfortable and prevents the eye from drying out.
- **Flexibility:** The lens needs to be flexible enough to conform to the eye's shape.
- **Biocompatibility:** The material should not cause irritation or adverse reactions in the eye.
- **Surface Wettability:** The lens surface should attract tears to maintain clarity and comfort.

Analysis of Contact Lens Materials

Let's examine the options provided:

Hydrogel Lenses

Hydrogel materials are soft, flexible polymers that contain a significant amount of water (typically 38%-79%). This high water content makes them very comfortable to wear and allows for good oxygen transmission to the cornea. Hydrogels are the most common material used for manufacturing the majority of soft contact lenses available today due to their excellent balance of comfort, oxygen permeability, and flexibility.

Teflon (PTFE)

Teflon, or Polytetrafluoroethylene (PTFE), is known for its chemical inertness and low friction. However, it is inherently rigid and hydrophobic (water-repelling). These properties make it generally unsuitable for standard soft contact lenses, which require flexibility and high water content for comfort and breathability.

Nylon

Nylon is a strong and flexible polymer. While used in various applications, including some medical devices, standard nylon may not offer the optimal oxygen permeability or water retention needed for comfortable, long-term contact lens wear compared to hydrogels. Some specialized nylon-based materials might be used, but hydrogels remain the predominant choice for soft lenses.

Mica

Mica is a naturally occurring silicate mineral. It is known for its transparency and heat resistance but is inherently brittle and crystalline. Its physical properties make it entirely unsuitable for use as a flexible contact lens material that needs to sit comfortably on the eye.

Conclusion on Contact Lens Materials

Based on the required properties for comfortable and safe wear, **hydrogel** materials are the most common and suitable choice for manufacturing standard contact lenses. They provide the necessary flexibility, water content, and oxygen permeability that materials like Teflon, Nylon, or Mica cannot typically offer for this application.

33. Answer: d

Explanation:

Understanding Toothpaste Ingredients

This question asks us to identify which of the listed substances is generally NOT used as an ingredient in toothpaste formulations. Toothpaste typically contains several key components designed for cleaning teeth, freshening breath, and preventing dental issues.

Analyzing Toothpaste Components

Let's examine the roles of the common ingredients mentioned:

- **Fluoride:** This is a crucial ingredient in most toothpastes. It strengthens tooth enamel, making it more resistant to acid attacks from plaque bacteria and sugars. It also helps remineralize weakened enamel. Examples include Sodium Fluoride (NaF) or Stannous Fluoride (SnF_2).
- **Calcium Carbonate:** This compound (CaCO_3) is frequently used as a mild abrasive agent. Its purpose is to help remove plaque, food particles, and surface stains from the teeth, contributing to a polishing effect.
- **Magnesium Carbonate:** Similar to calcium carbonate, magnesium carbonate (MgCO_3) can also function as a mild abrasive and polishing agent in some toothpaste recipes. It may also act as an anticaking agent.
- **Sodium Carbonate:** Also known as washing soda, sodium carbonate (Na_2CO_3) is a strong alkali. While it has cleaning properties, it is generally considered too harsh and potentially irritating for regular use in toothpaste. Its high alkalinity and potential abrasiveness make it unsuitable for direct oral application compared to other options.

Identifying the Non-Ingredient

Based on the typical composition and function of toothpaste ingredients:

- Fluoride is essential for cavity prevention.
- Calcium carbonate is a common abrasive/polishing agent.
- Magnesium carbonate can serve similar abrasive or anticaking roles.
- Sodium carbonate is not a standard or suitable ingredient for toothpaste due to its harshness.

Therefore, Sodium carbonate is the substance listed that is not typically found in toothpaste.

Final Answer Determination

The question asks which option is NOT an ingredient. Sodium carbonate is the correct choice because it's not a standard component of toothpaste.

Correct Option: B

34. Answer: b

Explanation:

Babur's Contribution to Popularizing Polo in 15th Century India

This solution explores the historical context of games played in India during the 15th century and identifies the game that Babur, the founder of the Mughal Empire, helped popularize.

Babur's Introduction to Indian Sports

Babur, a descendant of Timur and Genghis Khan, established the Mughal Empire in India. His arrival marked a significant cultural exchange, influencing various aspects of Indian life, including sports and pastimes. Babur himself was an avid sportsman and brought many Central Asian traditions with him.

The Game Popularized by Babur: Polo

Babur is historically credited with popularizing the game of Polo in India. Known in Persian as **Chaugan**, Polo was a favorite sport among the Timurid royalty and

nobility. Babur enjoyed playing Polo and introduced it widely across the northern Indian subcontinent after his conquest.

- Babur's memoirs, the *Baburnama*, mention his enjoyment of Polo.
- He often organized matches and encouraged its play among his courtiers and soldiers.
- The sport became a prominent royal pastime during his reign and the subsequent Mughal era.

Analyzing Other Game Options

Let's examine why the other options are incorrect in the context of Babur's influence in the 15th century:

- **Golf:** Golf has its origins in Scotland, and its popularization in India occurred much later, primarily during the British colonial period. It has no historical connection to Babur's time or his activities.
- **Kabaddi:** Kabaddi is an ancient traditional Indian sport with roots possibly dating back thousands of years. While popular in India, it was not introduced or popularized by Babur; it existed long before his arrival.
- **Karate:** Karate is a martial art that originated in Okinawa, Japan. Its development and spread occurred centuries after Babur's era and in a different part of the world, making any connection impossible.

Conclusion on Babur's Favorite Sport

Based on historical records and the origins of the respective sports, Polo (Chaugan) is the game that Babur made popular in India during his time. He brought this equestrian sport, which was already known in Central Asia, and established it as a significant royal and noble activity in the Indian subcontinent.

35. Answer: a

Explanation:

Understanding the Lieutenant Governor's Role in Indian Union Territories

The question asks about the correct description of a Lieutenant Governor (LG) in India. Lieutenant Governors function as the administrative heads of certain Union Territories (UTs) in India. Their specific powers and role depend on the constitutional provisions governing each UT. Let's analyze the given options to understand the accurate role of an LG.

Analysis of Options for Lieutenant Governor

We will examine each statement to determine its accuracy:

- **Option A: is appointed by the army.**

This statement is incorrect. Lieutenant Governors in India are not appointed by the army. They are appointed by the President of India, acting on the advice of the central government. The appointment process involves the executive branch of the central government, not the military establishment.

- **Option B: act as the nominal head of the union territory.**

This statement accurately describes the role of a Lieutenant Governor. In Union Territories that have an LG, they serve as the constitutional or nominal head, similar to how a Governor acts as the head of a state. The LG represents the President of India in the UT and exercises executive functions. In UTs with a legislative assembly and council of ministers (like Delhi or Puducherry), the LG generally acts on the aid and advice of the Council of Ministers, but retains certain discretionary powers and acts as a link between the Union Territory and the Central Government. Therefore, functioning as a 'nominal head' is a correct description.

- **Option C: they are elected by the people of India.**

This statement is incorrect. Lieutenant Governors are appointed officials, not elected representatives. Unlike Members of Parliament (MPs) or Members of

Legislative Assemblies (MLAs), citizens do not vote to elect the Lieutenant Governor. Their appointment is made by the President.

- **Option D: is accountable to the Council of Ministers of The Chief Minister.**

This statement is incorrect. The Lieutenant Governor is not accountable to the Council of Ministers or the Chief Minister of the Union Territory. Instead, the LG is accountable to the President of India. While the LG typically works with the Council of Ministers in UTs that have one, the ultimate administrative control and accountability rest with the President (and by extension, the Central Government). The Council of Ministers, headed by the Chief Minister, is accountable to the Legislative Assembly of the Union Territory, not the Lieutenant Governor.

Conclusion on Lieutenant Governor's Function

Based on the analysis, the most accurate description of a Lieutenant Governor in India among the given options is that they act as the nominal head of the union territory. This role involves representing the President and overseeing the administration, often acting upon the advice of local elected bodies where they exist, while remaining accountable to the Union President.

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36. Answer: b

Explanation:

Identifying Forms of Carbon

This question asks us to identify which of the given options is **not** a form of carbon. Carbon is a unique element that can exist in various structural forms, known as allotropes. Understanding these forms is key to answering the question.

Understanding Allotropes of Carbon

Allotropes are different structural forms of the same element in the same physical state. Carbon exhibits several allotropes due to its ability to form strong covalent bonds with itself in various ways. Common allotropes include diamond, graphite, fullerenes, and graphene.

Analyzing the Given Options

Let's examine each option:

- **Diamond:** Diamond is a very well-known allotrope of carbon. In diamond, carbon atoms are arranged in a crystal structure called a diamond cubic, where each carbon atom is covalently bonded to four other carbon atoms in a tetrahedral geometry. This structure makes diamond extremely hard.
- **Silicon:** Silicon (chemical symbol: Si) is a chemical element with atomic number 14. It belongs to the same group (Group 14) as carbon in the periodic table, meaning it has similar valence electron configurations. However, silicon is a distinct element with different chemical and physical properties. It is a semiconductor and forms the basis of much modern electronics. Silicon is **not** an allotrope or form of carbon.
- **Fullerene:** Fullerenes are compounds of carbon, forming hollow molecules. The most famous fullerene is Buckminsterfullerene (C_{60}), which has a structure resembling a soccer ball. Fullerenes are recognized as a distinct allotrope of carbon.
- **Graphene:** Graphene is an allotrope of carbon consisting of a single layer of carbon atoms arranged in a two-dimensional honeycomb lattice. It is known for its incredible strength, conductivity, and other unique properties.

Based on the analysis, diamond, fullerene, and graphene are all established forms (allotropes) of carbon.

Conclusion on Carbon Forms

Silicon, while chemically related to carbon as it sits below it in the periodic table, is an entirely different element. Therefore, silicon is **not** a form of carbon.

Classification of Options

Option	Material	Classification
A	Diamond	Form of Carbon (Allotrope)
B	Silicon	Different Element (Not a form of Carbon)
C	Fullerene	Form of Carbon (Allotrope)
D	Graphene	Form of Carbon (Allotrope)

Thus, the option that is **not** a form of carbon is Silicon.

37. Answer: c

Explanation:

Understanding Fatehpur Sikri Monuments

Fatehpur Sikri is a fascinating historical city located in Uttar Pradesh, India. It was built by the Mughal Emperor Akbar and served as the capital of the Mughal Empire from 1571 to 1585. The city is renowned for its well-preserved monuments, showcasing a blend of Indo-Islamic architectural styles.

Analyzing Fatehpur Sikri Monuments Mentioned

The question asks to identify which of the listed options is **not** a historical monument located in Fatehpur Sikri. Let's examine each option:

- **Buland Darwaza:** This is a monumental gateway situated in Fatehpur Sikri. It was built by Emperor Akbar to commemorate his victory in Gujarat.
- **Ibadat Khana:** Known as the 'House of Worship', the Ibadat Khana was a gathering house built by Akbar in Fatehpur Sikri where scholars and theologians debated various religious philosophies.

- **Panch Mahal:** This is a notable five-storied palace located in Fatehpur Sikri, believed to have been used by Akbar for relaxation and recreation.
- **Gol Gumbaj:** While a historically significant monument, the Gol Gumbaj is located in Bijapur, Karnataka, not in Fatehpur Sikri. It is the mausoleum of Mohammed Adil Shah, the seventh Sultan of the Adil Shahi dynasty.

Monument Location Comparison

To clearly answer the question, we can compare the locations of the monuments:

Monument Name	Description	Location
Buland Darwaza	Grand Gateway	Fatehpur Sikri, Uttar Pradesh
Ibadat Khana	House of Worship	Fatehpur Sikri, Uttar Pradesh
Panch Mahal	Five-Storied Palace	Fatehpur Sikri, Uttar Pradesh
Gol Gumbaj	Mausoleum of Mohammed Adil Shah	Bijapur, Karnataka

Identifying the Monument Not in Fatehpur Sikri

Based on the analysis, Buland Darwaza, Ibadat Khana, and Panch Mahal are all significant historical monuments found within the complex of Fatehpur Sikri. Conversely, Gol Gumbaj is located in a different state, Karnataka.

Therefore, Gol Gumbaj is the monument listed that is not a historical monument in Fatehpur Sikri.

Conclusion on Fatehpur Sikri Monuments

The correct option is the one that lists Gol Gumbaj, as it is the only monument listed that is not situated in Fatehpur Sikri.

The correct answer is **Gol Gumbaj**.

38. Answer: b

Explanation:

Understanding the Ratio of Light Speeds

The question asks for the term that describes the ratio between the speed of light in a medium and the speed of light in a vacuum. This ratio is a fundamental concept in optics and helps us understand how light behaves when it passes through different materials.

Defining Refractive Index

The **Refractive index** of a medium is a dimensionless number that describes how fast light travels through that medium. Specifically, it is defined as the ratio of the speed of light in a vacuum to the speed of light in that particular medium.

Mathematical Representation

We can express this relationship mathematically. Let:

- c be the speed of light in a vacuum (approximately 3×10^8 meters per second).
- v be the speed of light in the specific medium.
- n be the refractive index of the medium.

The formula is:

$$n = \frac{c}{v}$$

This equation shows that the refractive index (n) is directly calculated by dividing the speed of light in a vacuum (c) by the speed of light in the medium (v). A higher refractive index means light travels slower in that medium compared to a vacuum.

Analyzing the Options

Let's look at why the other options are not correct:

- **A. Reflective index:** While "reflection" is related to how light interacts with surfaces, "reflective index" is not the standard term for the ratio of speeds.
- **C. Mediweek index:** This term is not a recognized concept in physics related to the speed of light.
- **D. Air quality index:** This index measures the level of pollution in the air and has no relation to the speed of light or optical properties of a medium.

Conclusion on Refractive Index

Therefore, the correct term for the ratio of the speed of light in a medium to the speed of light in a vacuum is the **Refractive index**.

39. Answer: b

Explanation:

Calculating Profit Percentage on Apples

This problem involves finding the profit percentage earned by a shopkeeper based on the relationship between the cost price (CP) of a certain number of apples and the selling price (SP) of a different number of apples. We need to determine the profit percentage when the cost price of **40 apples** is equal to the selling price of **30 apples**.

Understanding Cost Price and Selling Price

Let's assume:

- The cost price (CP) of one apple is C .
- The selling price (SP) of one apple is S .

Relating CP and SP

According to the question, the cost price of 40 apples is equal to the selling price of 30 apples. We can write this as an equation:

Cost Price of 40 apples = Selling Price of 30 apples

Using our variables:

$$40 \times C = 30 \times S$$

To understand the relationship better, let's find the ratio of CP to SP. We can rearrange the equation:

$$\frac{C}{S} = \frac{30}{40}$$

Simplifying the fraction:

$$\frac{C}{S} = \frac{3}{4}$$

This ratio tells us that for every 3 units of cost price, the selling price is 4 units. For example, if the shopkeeper spends ₹3 to buy an apple (or a batch of apples), they sell them for ₹4.

Calculating Profit

Profit is calculated as the difference between the selling price and the cost price:

$$Profit = S - C$$

Using the ratio we found ($\frac{C}{S} = \frac{3}{4}$), we can assume:

- Let the Cost Price (CP) be **3 units**.
- Let the Selling Price (SP) be **4 units**.

Now, we can calculate the profit per unit:

$$\text{Profit} = 4 \text{ units} - 3 \text{ units} = 1 \text{ unit}$$

Determining Profit Percentage

The profit percentage is calculated using the formula:

$$\text{Profit Percentage} = \left(\frac{\text{Profit}}{\text{Cost Price}} \right) \times 100\%$$

Substituting the values we found:

$$\text{Profit Percentage} = \left(\frac{1 \text{ unit}}{3 \text{ units}} \right) \times 100\%$$

$$\text{Profit Percentage} = \frac{1}{3} \times 100\%$$

$$\text{Profit Percentage} = 33.33\ldots\%$$

Conclusion

The profit percentage earned by the shopkeeper is approximately **33.3%**.

Relevant Keywords

Keywords associated with this problem include: **profit percentage**, **cost price**, **selling price**, **profit calculation**, **ratio**, **apples**.

40. Answer: a

Explanation:

Odd One Out: Analyzing Word Pair Relationships

Understanding the Question Task

The question presents four pairs of words and asks us to identify the pair that is different from the others. This requires understanding the relationship between the words in each pair and finding the one that doesn't fit the common pattern.

Step-by-Step Analysis of Word Pairs

Let's examine the connection between the words in each option:

- **A. Equator : Hot:** The **Equator** is a geographical line around the Earth known for receiving direct sunlight, which typically results in warm or **hot** temperatures. This pair shows a location and its associated climate characteristic.
- **B. Pole : Cold:** The **Poles** (North and South) are geographical locations that receive very little direct sunlight, leading to extremely **cold** temperatures. This pair also shows a location and its associated climate characteristic.
- **C. River : Hot:** A **River** is a natural stream of water. While river water temperature can vary, and some rivers might be hot (e.g., due to geothermal activity), being **hot** is not a defining or inherent characteristic of a river in general. Rivers can be cold, temperate, or hot, but the term 'river' itself doesn't automatically imply 'hot'.
- **D. Winter : Cold:** **Winter** is a season characterized by low temperatures, often associated with cold weather. This pair shows a time period (season) and its typical associated temperature characteristic.

Identifying the Unique Pair

Comparing the pairs, we see a consistent pattern in options A, B, and D:

- Option A connects a location (Equator) with its general climate (Hot).
- Option B connects a location (Pole) with its general climate (Cold).
- Option D connects a season (Winter) with its general climate (Cold).

In these three pairs, the first word represents a place or a time of year that is strongly and generally associated with the condition described by the second word (temperature).

Option C, **River : Hot**, does not follow this pattern as strongly. A river is not inherently defined by being hot; its temperature is variable and not a universal characteristic

like the climate of the Equator or the coldness of the Poles or Winter.

Conclusion: The Odd Word Pair

The pair 'River : Hot' is the outlier because the relationship is not as direct or defining as in the other pairs. The other pairs link a geographical area or a season to its commonly known temperature characteristic.

Final Answer Choice

Therefore, the odd pair out is 'River : Hot', corresponding to option C.

41. Answer: c

Explanation:

Finding the Number: Understanding 35% of $\frac{9}{5}$ Calculation

This problem requires us to determine an unknown number based on a given condition involving a percentage and a fraction. We are told that 35% of $\frac{9}{5}$ of this number equals 252. Let's work through the steps to find this number.

Setting Up the Equation for the Number

First, we need to represent the unknown number using a variable. Let's call the number ' x '.

The problem statement can be translated into a mathematical equation:

- "35%" is equivalent to the fraction $\frac{35}{100}$.
- The word "of" in mathematics usually implies multiplication.
- So, "35% of $\frac{9}{5}$ of a number" can be written as $\frac{35}{100} \times \frac{9}{5} \times x$.
- We are given that this expression equals 252.

Therefore, the equation we need to solve is:

$$\frac{35}{100} \times \frac{9}{5} \times x = 252$$

Simplifying the Mathematical Expression

Before solving for 'x', it's helpful to simplify the fractions:

- Simplify the percentage fraction: $\frac{35}{100}$ can be reduced by dividing both the numerator and denominator by their greatest common divisor, which is 5. This gives $\frac{35 \div 5}{100 \div 5} = \frac{7}{20}$.
- Now substitute this back into the equation:

$$\frac{7}{20} \times \frac{9}{5} \times x = 252$$

- Next, multiply the two fractions together:

$$\frac{7 \times 9}{20 \times 5} \times x = 252$$

- $\frac{63}{100} \times x = 252$

Solving for the Number (x)

Our goal is to find the value of 'x'. To isolate 'x', we need to eliminate the fraction $\frac{63}{100}$ from the left side of the equation. We can do this by multiplying both sides of the equation by the reciprocal of $\frac{63}{100}$, which is $\frac{100}{63}$.

$$x = 252 \times \frac{100}{63}$$

Now, we carry out the calculation:

- First, divide 252 by 63. We can see that $63 \times 4 = 252$. So, $\frac{252}{63} = 4$.
- Now multiply this result by 100: $x = 4 \times 100$.

- $x = 400$

Final Result

By following these steps, we find that the number is 400. This value represents the solution to the condition stated in the problem.

42. Answer: c

Explanation:

Calculating Total Drugs Tested for Defective Items

This problem involves calculating the total number of drugs that need to be **tested** when a certain percentage is known to be **defective**. We are given the defect rate and the specific number of **defective drugs** identified.

Understanding the Problem

A **drug supervisor** dismisses drugs that are found to be defective. The rate at which drugs are dismissed is 0.05%. We need to find out the total quantity of drugs examined if exactly 4 drugs were dismissed as defective.

Identifying Key Information

- Percentage of defective drugs = 0.05%
- Number of defective drugs dismissed = 4
- Unknown: Total number of drugs tested

Mathematical Approach

Let 'T' represent the total number of drugs tested. The problem states that 0.05% of these total drugs are defective. The number of defective drugs found is 4.

We can express the relationship using the following formula:

Number of Defective Drugs = (Percentage of Defective Drugs / 100) × Total Number of Drugs Tested

Using LaTeX notation, this can be written as:

$$\text{Defective Drugs} = \frac{\text{Percentage}}{100} \times T$$

Calculation Steps

1. Substitute the known values into the formula: $4 = \frac{0.05}{100} \times T$
2. Convert the percentage to a decimal: $\frac{0.05}{100} = 0.0005$
3. Rewrite the equation with the decimal value: $4 = 0.0005 \times T$
4. To find the total number of drugs (T), rearrange the equation: $T = \frac{4}{0.0005}$
5. Perform the division: $T = \frac{4}{5/10000} = 4 \times \frac{10000}{5} = 4 \times 2000 \quad T = 8000$

Conclusion

The calculation shows that 8000 drugs must be tested to find 4 defective drugs when the defect rate is 0.05%. This matches option B.

Final Answer Verification

If 8000 drugs are tested, and 0.05% are defective:

Number of defective drugs = $0.05\% \times 8000 = \frac{0.05}{100} \times 8000 = 0.0005 \times 8000 = 4$. This confirms our calculation.

Therefore, 8000 drugs will be tested to dismiss 4 defective drugs.

43. Answer: b

Explanation:

Understanding Board Games: Identifying Bridge

The question asks us to identify which of the given options is **not** a board game. To answer this, we need to understand the definition of a **board game** and analyze each option provided: Snake and ladder, Chess, Bridge, and Checkers.

Defining a Board Game

A **board game** is generally defined as a game played on a pre-marked surface or "board," which might also be called a playing field or table. Players typically use pieces or counters that are moved or placed on the board according to a set of rules. The board is central to the gameplay.

Analysis of Game Options

- **Snake and ladder:** This is a well-known **board game**. It involves players moving their game pieces along a numbered track on a board, guided by the roll of a die. The board features ladders that help players climb up and snakes that send them down.
- **Chess:** **Chess** is a classic two-player strategy **board game** played on a checkered board. Players move pieces, each with unique movement rules, aiming to checkmate the opponent's king. The game intrinsically requires a board.
- **Bridge:** Unlike the other options, **Bridge** is a trick-taking **card game**. It is played by four players using a standard 52-card deck. The gameplay revolves around bidding and playing cards, not moving pieces on a board.
- **Checkers:** **Checkers**, also known as draughts, is a strategy **board game**. Played on a checkered board, players move pieces diagonally across the squares, capturing opponents' pieces. It is fundamentally a board game.

Conclusion: Identifying the Non-Board Game

Based on the analysis, Snake and ladder, Chess, and Checkers are all games that centrally feature a game board and pieces moved upon it. **Bridge**, however, is played using playing cards and does not involve a game board. Therefore, Bridge is the correct answer as it is **not** a board game.

44. Answer: b

Explanation:

Understanding Geographic Indication (GI) Status

Geographic Indication (GI) is a sign used on products that have a specific geographical origin and possess qualities or a reputation that are due to that origin. It provides legal protection to these items, ensuring that only those producers adhering to the specific standards associated with the geographical area can use the indication. This status helps consumers identify genuine products and protects producers from unfair competition.

Analyzing Key Terms: GI and Agricultural Origin

The question focuses on what type of agricultural item receives **legal protection** through **Geographic Indication (GI) status**. The key characteristics mentioned are a **unique geographic origin** and development. We need to determine which of the given options best fits this description for agricultural items.

Evaluating Options for Protection by GI

Let's examine each option in the context of GI protection:

- **A. Product:** GI status is fundamentally designed to protect specific *products* that originate from a particular geographical region. Agricultural products like Darjeeling Tea, Basmati Rice, or Parmesan Cheese are classic examples. Their quality, characteristics, and reputation are intrinsically linked to their place of origin.
- **B. Land:** While GI status is tied to a specific geographical area (land), the protection itself is not granted to the land itself. The protection is for the items produced *on* or *from* that land.
- **C. Tools:** GI protection typically covers the final product, not the tools used in its production. While specific traditional tools might be part of the production process, the GI designation itself applies to the output, not the implements.
- **D. Waste:** GI status is granted to valuable products with established reputations, not to waste materials generated during production.

Identifying the Correct Agricultural Component

Based on the definition and purpose of Geographic Indication, it protects items that are a result of specific geographical factors and human ingenuity tied to that location. For agriculture, this directly applies to the **products** harvested or processed from that region. The unique qualities and reputation stem from the soil, climate, farming practices, and traditions associated with the specific geographical area. Therefore, 'Product' is the most fitting term.

Final Conclusion on GI Protection

Geographic Indication (GI) status provides essential **legal protection** to **agricultural products** that are distinguished by their **unique geographic origin** and the associated methods of development and production. The protection ensures the authenticity and quality that consumers expect from products tied to a specific place.

The correct option is the one that identifies the item being protected, which is the agricultural **Product**.

45. Answer: a

Explanation:

Understanding Phosphorus Storage

The question asks why **phosphorus** is kept under water. To understand this, we need to consider the chemical properties of **phosphorus**, especially how it interacts with its environment.

Reactivity of Phosphorus

Phosphorus, particularly in its white allotrope form, is known for its high reactivity. A key characteristic is its reaction with oxygen, which is abundant in the air.

- When exposed to air, **phosphorus** reacts vigorously with oxygen.
- This process, called oxidation, releases a significant amount of heat.

- The heat produced is often sufficient to cause the **phosphorus** to ignite spontaneously, meaning it starts **catching fire** without any external ignition source. This property is known as pyrophoricity.

The Role of Water in Storage

Storing **phosphorus** submerged in water is a common and effective safety procedure. Water serves a critical function in this context:

- Water acts as a physical barrier, preventing the **phosphorus** from coming into direct contact with oxygen in the air.
- By isolating the **phosphorus** from oxygen, the water effectively prevents the rapid oxidation process.
- Consequently, this prevents the element from overheating and **catching fire**.

Analysis of Options

Let's examine the provided options:

- A. Avoid spoilage: While water can prevent spoilage in some materials by inhibiting microbial growth or oxidation, the primary reason for storing **phosphorus** in water relates to its immediate fire hazard, not general spoilage.
- B. Avoid catching fire: This option directly addresses the pyrophoric nature of **phosphorus**. Storing it under water successfully prevents it from igniting in air.
- C. Ensure durability: Durability usually refers to the ability of a material to withstand wear, pressure, or damage over time. While preventing reaction preserves the substance, the term 'durability' isn't the most precise description for the safety measure against combustion.
- D. Stay out of reach of children: While safety is paramount when handling hazardous substances like **phosphorus**, storing it under water is a chemical safety measure to prevent fire, not primarily a physical method to keep it away from children. Specific containment and storage protocols usually address accessibility.

Conclusion on Phosphorus Storage

Based on its chemical properties, the essential reason for keeping **phosphorus** under water is to prevent it from contacting atmospheric oxygen and thereby avoid the risk of it **catching fire**.

46. Answer: a

Explanation:

Arithmetic Expression Evaluation

This problem involves evaluating a mathematical expression where letters represent different arithmetic operations. We need to substitute the correct operators and then calculate the value using the standard order of operations (BODMAS/PEMDAS).

Operator Substitution

First, we establish the meaning of each letter provided:

- E means addition (+)
- F means multiplication ($\times$)
- G means division ($\div$)
- H means subtraction ($-$)

Expression Substitution

The expression given is:

81 H 1 G 17 F 102 G 6 F 34 H 6

Substituting the operators according to the rules:

- Replace H with $-$
- Replace G with $\div$
- Replace F with $\times$

The expression transforms into:

$$81 - 1 \div 17 \times 102 \div 6 \times 34 - 6$$

Order of Operations Application

To correctly evaluate the expression, we follow the BODMAS/PEMDAS rule:

1. Brackets / Parentheses
2. Orders / Exponents
3. Division and Multiplication (performed from left to right)
4. Addition and Subtraction (performed from left to right)

In our expression, $81 - 1 \div 17 \times 102 \div 6 \times 34 - 6$, we only have division, multiplication, and subtraction.

Step-by-Step Expression Calculation

We evaluate the expression $81 - 1 \div 17 \times 102 \div 6 \times 34 - 6$ using BODMAS/PEMDAS:

1. Division and Multiplication (from left to right):

- First, calculate $1 \div 17$. The result is $\frac{1}{17}$.
- Next, multiply this result by 102: $\frac{1}{17} \times 102 = \frac{102}{17} = 6$.
- The expression now becomes: $81 - 6 \div 6 \times 34 - 6$
- Next, calculate $6 \div 6$. The result is 1.
- The expression now becomes: $81 - 1 \times 34 - 6$
- Finally, calculate 1×34 . The result is 34.
- The expression simplifies to: $81 - 34 - 6$

2. Addition and Subtraction (from left to right):

- First, calculate $81 - 34$. The result is 47.
- The expression becomes: $47 - 6$
- Finally, calculate $47 - 6$. The result is 41.

Final Expression Result

After performing all the operations in the correct order, the value of the expression is 41.

47. Answer: c

Explanation:

Understanding the Concept of Encoding

Encoding is a fundamental process in computing and data communication. It involves converting information, like text, characters, or signals, from one format into another, typically following a specific set of rules or standards (a code). The main goals often include enabling data storage, transmission, processing, or security. Let's analyze how each option relates to this concept.

Analyzing the Options Related to Encoding

We need to identify the option that does not fit the typical definition or purpose of **encoding**.

Option A: Transforming Data into Another Format

This option aligns perfectly with the core definition of **encoding**. Encoding fundamentally transforms data from its original format into a new one. For instance, converting plain text into binary code (like ASCII or UTF-8) is a classic example of transforming data into another format.

Option B: Transformation of Coded Data

This option refers to changing data that is already in a coded format. While processes like character set conversion (e.g., UTF-8 to UTF-16) or certain types of data manipulation involve transforming already **coded data**, this is generally considered a step *after* the initial **encoding** process. **Encoding** itself is typically the initial conversion of raw data into a coded representation. Transforming already coded data is a different, subsequent operation.

Option C: Placing Characters in Coded Format in Sequence

This option describes how encoded information is often structured. Once data is encoded, it usually results in a sequence of characters, symbols, or bits according to the rules of the specific code. For example, text encoded in ASCII results in a sequence of numerical codes representing each character. This is a direct outcome of the **encoding** process.

Option D: Helping Program Compilation and Execution

This highlights a critical consequence and application of **encoding**, especially character encoding. Computers process data using numerical representations. Character **encoding** schemes (like ASCII, UTF-8) provide these representations, allowing programs to correctly interpret text, compile source code, and execute instructions involving characters. Without proper encoding, compilation and execution would fail or produce incorrect results.

Identifying the Odd Option Out

Comparing the options, A, C, and D describe the definition, structure, and purpose/benefit of **encoding** respectively. Option B, however, discusses the "**Transformation of coded data**," which refers to manipulating data that has already been encoded, rather than the primary act of encoding itself. Therefore, option B stands out as different from the others.

Conclusion on Encoding Oddity

The process of **encoding** primarily involves the initial conversion of data into a different format (A), resulting in a sequence (C), and enabling functions like program compilation (D). The **transformation of coded data** (B) is a secondary manipulation rather than the core definition or direct purpose of encoding itself. Hence, it is the odd one out.

48. Answer: a

Explanation:

Understanding Investment Ratios and Returns

This problem involves calculating the total income based on initial investments and their respective return percentages. We are given the ratio of investments for Ritesh, Gaurav, and Jugnu, and also the ratio of their profit percentages. A condition is provided about the difference in earnings between Gaurav and Ritesh, which helps us find the actual earnings.

Defining Variables and Ratios

Let the investments made by Ritesh, Gaurav, and Jugnu be I_R , I_G , and I_J respectively. According to the question, their investment ratio is:

$$I_R : I_G : I_J = 2 : 5 : 7$$

We can represent their investments as $2x$, $5x$, and $7x$, where x is a common multiplier.

Let the return percentages on their investments be P_R , P_G , and P_J . The ratio of these return percentages is given as:

$$P_R : P_G : P_J = 5 : 3 : 2$$

We can represent these return percentages as $5y$, $3y$, and $2y$, where y is another common multiplier.

Calculating Individual Earnings

The earning (profit) for each person is calculated as: Earning = Investment $\times$ Return Percentage.

- Ritesh's Earning (E_R):

$$E_R = I_R \times P_R = (2x) \times (5y) = 10xy$$

- Gaurav's Earning (E_G):

$$E_G = I_G \times P_G = (5x) \times (3y) = 15xy$$

- Jugnu's Earning (E_J):

$$E_J = I_J \times P_J = (7x) \times (2y) = 14xy$$

Using the Condition to Find the Value of 'xy'

The problem states that Gaurav earns more than Rs 150 from Ritesh. This means the difference between Gaurav's earning and Ritesh's earning is greater than Rs 150. To find a specific total income corresponding to the options, we assume this difference is exactly Rs 150.

$$E_G - E_R > 150$$

Substituting the expressions for their earnings:

$$15xy - 10xy > 150$$

$$5xy > 150$$

Assuming the difference is exactly Rs 150 to match the options:

$$5xy = 150$$

Solving for the common product xy :

$$xy = \frac{150}{5}$$

$$xy = 30$$

Calculating the Total Income

The total income is the sum of the earnings of Ritesh, Gaurav, and Jugnu.

$$\text{Total Income} = E_R + E_G + E_J$$

$$\text{Total Income} = 10xy + 15xy + 14xy$$

$$\text{Total Income} = (10 + 15 + 14)xy$$

$$\text{Total Income} = 39xy$$

Now, substitute the value of xy we found:

$$\text{Total Income} = 39 \times 30$$

$$\text{Total Income} = 1170$$

Conclusion

The total income calculated is Rs 1170. This matches option A.

49. Answer: c

Explanation:

Classification	Prime	Even	Odd
Code	4	5	3

According to the alphabetical positions of the letters,

Alphabets	A	B	C	D	E	F	G	H	I	J	K	L	M
Positional value	1	2	3	4	5	6	7	8	9	10	11	12	13
Positional value	26	25	24	23	22	21	20	19	18	17	16	15	14
Alphabets	Z	Y	X	W	V	U	T	S	R	Q	P	O	N

Letter	E	D	U	C	A	T	I	O	N
Position Value	5	4	21	3	1	20	9	15	14
Code	4	5	3	4	3	5	3	3	5

Hence, ' 453435335 ' is the correct answer.

50. Answer: a

Explanation:

Understanding Simple Interest Calculation

This question involves calculating simple interest and how a change in the interest rate affects the final amount. We are given the principal amount, the time period, and the amount after that time. First, we need to find the original rate of interest, then calculate the new rate after the increase, and finally determine the new amount.

Calculating Initial Simple Interest

The starting principal amount (P) is Rs 1500.

After 2 years, the amount (A1) becomes Rs 1800.

The time period (T) is 2 years.

The Simple Interest (SI) earned is the difference between the final amount and the principal.

Formula: $A1 = P + SI$

Calculating SI: $SI = A_1 - P = 1800 - 1500 = 300$

So, the simple interest earned over 2 years was Rs 300.

Determining the Original Rate of Interest

To find the original rate of interest (R), we use the simple interest formula:

Formula: $SI = \frac{P \times R \times T}{100}$

We have the values: SI = 300, P = 1500, T = 2.

Substituting these into the formula:

$$300 = \frac{1500 \times R \times 2}{100}$$

Simplify the calculation:

$$300 = \frac{3000 \times R}{100}$$

$$300 = 30 \times R$$

Solve for R:

$$R = \frac{300}{30}$$

$$R = 10\%$$

The original rate of simple interest was 10% per year.

Calculating the New Rate of Interest

The problem states that the rate of interest is increased by 5%.

Original Rate (R) = 10%

Increase in Rate = 5%

New Rate (R_{new}) = Original Rate + Increase

$$R_{new} = 10\% + 5\% = 15\%$$

The new rate of interest is 15% per year.

Calculating the New Amount

Now, we calculate the new amount (A_2) using the principal ($P = 1500$), the new rate ($R_{new} = 15\%$), and the time period ($T = 2$ years).

First, find the new simple interest (SI_{new}):

$$\text{Formula: } SI_{new} = \frac{P \times R_{new} \times T}{100}$$

Substitute the values:

$$SI_{new} = \frac{1500 \times 15 \times 2}{100}$$

Simplify:

$$SI_{new} = 15 \times 15 \times 2$$

$$SI_{new} = 225 \times 2$$

$$SI_{new} = 450$$

The new simple interest earned is Rs 450.

Finally, calculate the new total amount (A_2):

$$\text{Formula: } A_2 = P + SI_{new}$$

Substitute the values:

$$A_2 = 1500 + 450$$

$$A_2 = 1950$$

The new amount after 2 years, with the interest rate increased by 5%, is Rs 1950.

Conclusion

By first calculating the initial simple interest and rate, and then applying the increased rate, we found the new amount. The original rate was 10%, which increased to 15%. This resulted in a new amount of Rs 1950.

51. Answer: c

Explanation:

Understanding Population Variance and Standard Deviation

This question focuses on the relationship between two key statistical measures related to data spread: the **population variance** and the **population standard deviation**. We are given the standard deviation and need to find the variance.

Definitions of Statistical Measures

- **Population Standard Deviation (σ):** This value represents the average amount that each data point in a population deviates from the population mean. It's a measure of data dispersion. A smaller value means data points are closer to the mean, while a larger value indicates they are spread further out.
- **Population Variance (σ^2):** This is calculated as the average of the squared differences of each data point from the population mean. It also measures data dispersion but is expressed in squared units.

Linking Standard Deviation and Variance

The **population variance** (σ^2) and the **population standard deviation** (σ) are directly related. The variance is simply the square of the standard deviation.

The formula is:

$$\sigma^2 = (\sigma)^2$$

This means to find the variance, you square the standard deviation.

Calculation of Population Variance

The problem states that the **population standard deviation** (σ) is 11.

Using the relationship $\sigma^2 = (\sigma)^2$, we can calculate the **population variance**:

$$\sigma^2 = (11)^2$$

Calculating the square:

$$\sigma^2 = 11 \times 11$$

$$\sigma^2 = 121$$

So, the population variance is 121.

Matching Calculation to Options

We need to find the option that matches our calculated variance:

- Option A: 44
- Option B: 121
- Option C: 22
- Option D: 33

Our calculated value of 121 corresponds directly to Option B.

Conclusion on Variance

By understanding that the **population variance** is the square of the **population standard deviation**, and given the standard deviation is 11, squaring this value (11^2) gives us the variance, which is 121.

52. Answer: b

Explanation:

Average Human Body Temperature Explained

Understanding the **average temperature** of the human body is a fundamental concept in biology and health. The body's internal functions rely on maintaining a relatively stable temperature.

Defining Average Human Body Temperature

The term **average temperature** refers to the typical temperature reading considered normal for a healthy human. This value can fluctuate based on factors like time of day, activity level, and individual metabolism.

The generally accepted **average temperature** for the human body is 37°C .

Evaluating the Options for Human Body Temperature

Let's examine the choices provided:

- A. 34°C : This temperature is considerably lower than the normal average and would indicate a dangerously low body temperature (hypothermia).
- B. 35°C : This is also below the standard average and is considered a low body temperature.
- C. 36°C : While close to the average, this value is typically considered slightly below the standard norm of 37°C .
- D. 37°C : This is the widely recognized and cited **average temperature** for a healthy human body.

Key Takeaway on Human Body Temperature

The consensus in the medical and scientific community identifies 37°C as the standard **average temperature** of the human body. Variations within a small range around this value are considered normal.

53. Answer: d

Explanation:

Detailed Solution for Mixing Ratios of Acid and Water

This problem involves calculating the ratio in which two different mixtures of acid and water must be combined to achieve a specific acid-to-water ratio in the final mixture. We will analyze the proportions of acid (or water) in each container and the target mixture.

Understanding the Initial Ratios

We are given two containers with different mixtures of acid and water:

- **Container 1:** The ratio of acid to water is 3 : 1.
- **Container 2:** The ratio of acid to water is 5 : 3.

Our goal is to find the ratio in which these two mixtures should be mixed to obtain a new mixture where the ratio of acid to water is 2 : 1.

Calculating Proportions of Acid

To solve this using the method of alligation, it's easiest to focus on the proportion of one component, such as acid, in each mixture.

- **Container 1:**
 - Ratio = 3 : 1 (Acid : Water)
 - Total parts = 3 + 1 = 4
 - Proportion of Acid = $\frac{\text{Acid Parts}}{\text{Total Parts}} = \frac{3}{4}$
- **Container 2:**
 - Ratio = 5 : 3 (Acid : Water)
 - Total parts = 5 + 3 = 8
 - Proportion of Acid = $\frac{\text{Acid Parts}}{\text{Total Parts}} = \frac{5}{8}$
- **Desired New Mixture:**
 - Ratio = 2 : 1 (Acid : Water)

- Total parts = $2 + 1 = 3$
- Desired Proportion of Acid = $\frac{\text{Acid Parts}}{\text{Total Parts}} = \frac{2}{3}$

Applying the Method of Alligation

The method of alligation helps us find the ratio of quantities when two quantities (having different concentrations/proportions) are mixed to produce a required concentration/proportion.

Let the ratio in which the mixture from Container 1 and Container 2 are mixed be $x : y$.

We place the proportion of acid from each container and the desired proportion in the middle:

Mixture 1 (Acid Proportion) ($\frac{3}{4}$)	Desired Mixture (Acid Proportion) ($\frac{2}{3}$)	Mixture 2 (Acid Proportion) ($\frac{5}{8}$)
$\frac{3}{4}$		$\frac{5}{8}$
(Difference: $\frac{3}{4} - \frac{2}{3}$) $\frac{9-8}{12} = \frac{1}{12}$	$\frac{2}{3}$	(Difference: $\frac{2}{3} - \frac{5}{8}$) $\frac{16-15}{24} = \frac{1}{24}$

The ratio $x : y$ is the ratio of the differences obtained (crosswise).

Ratio $x : y = (\text{Difference for Mixture 2}) : (\text{Difference for Mixture 1})$

Ratio $x : y = (\frac{2}{3} - \frac{5}{8}) : (\frac{3}{4} - \frac{2}{3})$

Ratio $x : y = \frac{1}{24} : \frac{1}{12}$

Calculating the Final Mixing Ratio

To find the simplest form of the ratio $\frac{1}{24} : \frac{1}{12}$, we can multiply both sides by the least common multiple of the denominators (24 and 12), which is 24.

$$\text{Ratio } x : y = \left(\frac{1}{24} \times 24\right) : \left(\frac{1}{12} \times 24\right)$$

$$\text{Ratio } x : y = 1 : 2$$

Conclusion

Therefore, the mixtures from the two containers should be mixed in the ratio of 1 : 2 to obtain a new mixture with an acid to water ratio of 2 : 1.

54. Answer: d

Explanation:

Understanding Network Hubs

This solution explains the characteristics of a network 'hub' and identifies the statement that is not true about it. We will look at what a hub does in a network and evaluate each option based on its definition.

What is a Network Hub?

A network hub is a physical hardware device used in computer networking. Its main purpose is to connect multiple devices (like computers, printers) together in a network segment, typically a Local Area Network (LAN). When a hub receives data from one connected device, it simply broadcasts that data to all other connected devices, regardless of which device the data is intended for. This makes it a basic, non-intelligent networking component.

Analyzing the Options

Let's examine each statement regarding the word 'hub':

- A. It is used to connect parts of a LAN.

This statement is **true**. A hub serves as a central connection point, linking various devices or network segments within a Local Area Network (LAN).

- B. Hub is software.

This statement is **false**. A hub is a physical piece of network hardware, not software. Software handles tasks, processes, and operating systems, whereas a hub is a tangible device with ports.

- C. Common point of connecting in PC.

This statement is generally **true**. A hub acts as a central or common point where multiple computers (PCs) or other network devices can be connected to form a network.

- D. It contains multiple ports.

This statement is **true**. Hubs are characterized by having multiple ports (usually Ethernet ports) that allow network cables from different devices to be plugged in.

Identifying the Incorrect Statement

Based on the analysis, the statement that is not true about a network hub is that it is software. Hubs are fundamental hardware components used for network connectivity. Therefore, option B correctly identifies the false statement.

55. Answer: c

Explanation:

Finding Sapna's Age Using Age Relationships

This problem involves solving a system of equations derived from the relationship between Sapna's age and Anubha's age. We are given two key pieces of information:

- The **product** of their ages is 150.
- 4 times Anubha's age is 10 years less than Sapna's age.

Our goal is to determine Sapna's current age.

Defining Variables and Equations

Let's represent the unknown ages with variables:

- Let S be the age of Sapna.
- Let A be the age of Anubha.

We can translate the given information into mathematical equations:

1. **Product of Ages:** The product of Sapna's age (S) and Anubha's age (A) is 150.

$$S \times A = 150$$

2. **Age Relationship:** 4 times Anubha's age ($4A$) is 10 years less than Sapna's age (S).

$$4A = S - 10$$

Solving the System of Equations

We need to solve these two equations simultaneously to find the values of S and A . We can use substitution:

1. **Express S in terms of A:** From the second equation, we can isolate S :

$$S = 4A + 10$$

2. **Substitute into the first equation:** Now, substitute this expression for S into the first equation ($S \times A = 150$):

$$(4A + 10) \times A = 150$$

3. **Form a quadratic equation:** Expand the equation and rearrange it into the standard quadratic form ($ax^2 + bx + c = 0$):

$$4A^2 + 10A = 150$$

$$4A^2 + 10A - 150 = 0$$

4. **Simplify the equation:** We can simplify the quadratic equation by dividing all terms by 2:

$$2A^2 + 5A - 75 = 0$$

5. **Solve the quadratic equation for A:** We can solve this equation by factoring or using the quadratic formula. Let's factor it:

- Find two numbers that multiply to $2 \times (-75) = -150$ and add up to 5. These numbers are 15 and -10.
- Rewrite the middle term: $2A^2 + 15A - 10A - 75 = 0$.
- Factor by grouping: $A(2A + 15) - 5(2A + 15) = 0$.
- Factor out the common term: $(A - 5)(2A + 15) = 0$.

This gives two possible values for A :

- $A - 5 = 0 \implies A = 5$
- $2A + 15 = 0 \implies 2A = -15 \implies A = -\frac{15}{2} = -7.5$

6. **Choose the valid age:** Since age cannot be negative, Anubha's age (A) must be 5 years.

Calculating Sapna's Age

Now that we have found Anubha's age ($A = 5$), we can find Sapna's age (S) using the relationship we found earlier ($S = 4A + 10$):

$$S = 4(5) + 10$$

$$S = 20 + 10$$

$$S = 30$$

So, Sapna's age is 30 years.

Verification

Let's check if these ages satisfy the initial conditions:

- **Product of ages:** $30 \times 5 = 150$. This matches the first condition.
- **Age relationship:** $4 \times A = 4 \times 5 = 20$. $S - 10 = 30 - 10 = 20$. Since $4A = S - 10$, this matches the second condition.

The calculated ages are correct.

Conclusion

The question asks for Sapna's age. Based on our calculations, Sapna's age is 30 years.

56. Answer: b

Explanation:

Seller Profit Calculation Based on Expected Return

This question requires us to find the specific profit amount a seller made on a particular day, given their expected return percentage on the purchase price and the total sales for that day.

Seller's Terms Explained: Purchase Price, Sales, Profit

It's important to understand the basic terms used:

- **Purchase Price (Cost Price):** This is the amount the seller originally paid for the goods. Let's call it P .
- **Sales Price (Selling Price):** This is the total amount the seller received from customers. We are given this as $S = \text{Rs. } 528$.
- **Profit:** This is the money the seller makes after covering the purchase price. It's calculated as $S - P$.
- **Expected Return Rate:** This is the profit expressed as a percentage of the purchase price. The seller expects a 32% return, meaning $\text{Profit} = 0.32 \times P$.

Sales Price and Profit Calculation Setup

We can establish relationships between these values:

1. The profit is a percentage of the purchase price:

$$\text{Profit} = 0.32 \times P$$

1. The sales price is the sum of the purchase price and the profit:

$$S = P + \text{Profit}$$

We can combine these two equations. Substituting the first equation into the second one:

$$S = P + (0.32 \times P)$$

Factor out the purchase price, P :

$$S = P(1 + 0.32)$$

$$S = P(1.32)$$

Sales Price Expression Using Return Rate

This equation, $S = 1.32 \times P$, tells us that the sales price is 132% of the purchase price.

Purchase Price Calculation

Now, we can use the given sales amount ($S = \text{Rs. } 528$) to find the purchase price (P):

$$\text{Rs. } 528 = P \times 1.32$$

To isolate P , we divide the sales price by 1.32:

$$P = \frac{\text{Rs. } 528}{1.32}$$

To make the division easier, we can multiply the numerator and denominator by 100:

$$P = \frac{52800}{132}$$

Performing the division:

$$P = \text{Rs. } 400$$

Therefore, the **purchase price** of the goods was Rs. 400.

Profit Amount Calculation

With the purchase price known, we can now calculate the profit amount. We can use the expected return rate:

$$\text{Profit} = 0.32 \times P$$

$$\text{Profit} = 0.32 \times \text{Rs. } 400$$

$$\text{Profit} = \text{Rs. } 128$$

Alternatively, we can subtract the purchase price from the sales price:

$$\text{Profit} = S - P$$

$$\text{Profit} = \text{Rs. } 528 - \text{Rs. } 400$$

$$\text{Profit} = \text{Rs. } 128$$

Both calculations confirm that the **profit amount** is Rs. 128.

Correct Profit Amount Identified

The calculated profit is Rs. 128. Let's check the options provided:

- A. Rs. 120
- B. Rs. 128
- C. Rs. 132
- D. Rs. 140

Our calculated profit amount matches option B.

Profit Calculation Summary Table

Parameter	Details
Expected Return Rate	32% of Purchase Price
Total Sales	Rs. 528
Purchase Price	Rs. 400
Calculated Profit Amount	Rs. 128

57. Answer: c

Explanation:

This solution explains how to find the difference between the total number of specific books in Branch I and Branch II, based on the provided library data.

Analyzing Library Book Data

The table provides the number of books for different subjects across three library branches. We need to focus on specific subjects in Branch I and Branch II.

Subject	Branch I	Branch II	Branch III
Fiction	130	70	240
Science	260	140	120
IT	65	280	180
History	195	210	60

Calculating Total Books in Branch I

First, we identify the total number of fiction literature and science books available in Branch I.

- Number of Fiction books in Branch I = 130
- Number of Science books in Branch I = 260

The total is calculated as:

Total Branch I = Number of Fiction books + Number of Science books

$$\text{Total Branch I} = 130 + 260 = 390$$

Calculating Total Books in Branch II

Next, we find the total number of IT and history books in Branch II.

- Number of IT books in Branch II = 280
- Number of History books in Branch II = 210

The total is calculated as:

Total Branch II = Number of IT books + Number of History books

$$\text{Total Branch II} = 280 + 210 = 490$$

Determining the Difference Between Totals

The question asks for the difference between the total books calculated for Branch I and Branch II.

Difference = Total books in Branch II – Total books in Branch I

(We take the larger value minus the smaller value to get a positive difference as per the options.)

$$\text{Difference} = 490 - 390$$

$$\text{Difference} = 100$$

Final Answer Selection

The calculated difference is 100. Comparing this value with the given options:

- A. 90
- B. 100
- C. 110
- D. 120

The calculated difference matches option B.

58. Answer: d

Explanation:

Understanding the Library Book Distribution

The question asks us to find the ratio between the number of **science books** in **Branch I** and the number of **fiction literature books** in **Branch II**, based on the provided table.

The table displays the count of books for different subjects across three library branches. We need to locate specific values from this data.

Extracting Relevant Book Counts

First, let's identify the required numbers from the table:

- Number of **science** books in **Branch I**.
- Number of **fiction literature** books in **Branch II**.

Looking at the table:

- The count for 'Science' books in 'Branch I' is 260.
- The count for 'Fiction' books in 'Branch II' is 70.

Subject	Branch I	Branch II	Branch III
Fiction	130	70	240
Science	260	140	120
IT	65	280	180
History	195	210	60

Calculating the Ratio of Books

The question requires the ratio of the number of science books in Branch I to the number of fiction books in Branch II.

Let $N_{Science, Branch I}$ be the number of science books in Branch I.

Let $N_{Fiction, Branch II}$ be the number of fiction books in Branch II.

From the table, we have:

- $N_{Science, Branch I} = 260$
- $N_{Fiction, Branch II} = 70$

The required ratio is calculated as:

$$\text{Ratio} = \frac{N_{\text{Science, Branch I}}}{N_{\text{Fiction, Branch II}}} = \frac{260}{70}$$

Simplifying the Ratio

To simplify the ratio $\frac{260}{70}$, we can divide both the numerator and the denominator by their greatest common divisor.

Both 260 and 70 are divisible by 10.

$$\frac{260 \div 10}{70 \div 10} = \frac{26}{7}$$

The simplified ratio is 26 : 7.

Comparing with Options

Now, let's compare our calculated ratio with the given options:

- A. 13 : 24
- B. 26 : 7
- C. 12 : 13
- D. 13 : 12

Our calculated ratio of 26 : 7 matches option B.

Conclusion

The ratio of the number of science books of branch I to the number of books of fiction literature of branch II is 26:7.

59. Answer: c

Explanation:

Library Book Comparison: History Books Analysis

Analyzing Branch History Book Data

The question asks us to compare the number of history books in Branch III with the average number of history books across all three library branches. First, let's identify the relevant data from the provided table:

Subject	Branch I	Branch II	Branch III
Fiction	130	70	240
Science	260	140	120
IT	65	280	180
History	195	210	60

- Number of history books in Branch I = 195
- Number of history books in Branch II = 210
- Number of history books in Branch III = 60

Calculating the Average Number of History Books

To find the average number of history books across all three branches, we need to sum the history books from each branch and then divide by the number of branches (which is 3).

- **Step 1: Sum the history books**

Total History Books = (History Books Branch I) + (History Books Branch II) + (History Books Branch III)

Total History Books = $195 + 210 + 60$

Total History Books = 465

- **Step 2: Calculate the average**

Average History Books = $\frac{\text{Total History Books}}{\text{Number of Branches}}$

Average History Books = $\frac{465}{3}$

Average History Books = 155

So, the average number of history books available in the three branches is 155.

Determining How Many Fewer History Books are in Branch III

The question asks how much less the number of history books in Branch III is compared to the average number of history books across all branches. We need to calculate the difference between the average and the number of history books in Branch III.

- Difference = (Average History Books) – (History Books Branch III)
Difference = $155 - 60$
Difference = 95

The number of history books in Branch III is 95 less than the average number of history books of all three branches.

Matching the Result with the Options

Now, let's compare our calculated difference with the given options:

- A. 100
- B. 115
- C. 95
- D. 85

Our calculated difference is 95, which matches option C.

Final Answer Justification

The calculation shows that the number of history books in Branch III (60) is indeed 95 less than the average number of history books across all three branches (155). Therefore, the correct option is C.

60. Answer: c

Explanation:

Solving for 'a' using the Polynomial Factor Theorem

This question requires us to find the value of 'a' in a given polynomial, $3x^4 - (a + 2)x^3 - x^2 - 4$, knowing that $(x - 2)$ is one of its factors. We can effectively solve this by applying the Factor Theorem.

Understanding the Polynomial and its Factor

The polynomial given is $P(x) = 3x^4 - (a + 2)x^3 - x^2 - 4$.

We are informed that $(x - 2)$ is a factor of this polynomial $P(x)$.

Key Concept: The Factor Theorem

The Factor Theorem is a crucial result in algebra. It states that a polynomial $P(x)$ has a factor $(x - c)$ if and only if $P(c) = 0$. In simpler terms, if you plug the root of the factor (which is c) into the polynomial, the result should be zero.

For our specific problem, the given factor is $(x - 2)$. By comparing this to the general form $(x - c)$, we see that $c = 2$. According to the Factor Theorem, this means that when we substitute $x = 2$ into the polynomial $P(x)$, the result must be 0. That is, $P(2) = 0$.

Applying the Factor Theorem to Find 'a'

We will now substitute $x = 2$ into the polynomial $P(x)$ and set the expression equal to 0:

$$P(2) = 3(2)^4 - (a + 2)(2)^3 - (2)^2 - 4$$

First, let's evaluate the powers of 2:

- $2^4 = 2 \times 2 \times 2 \times 2 = 16$
- $2^3 = 2 \times 2 \times 2 = 8$
- $2^2 = 2 \times 2 = 4$

Substitute these values back into the equation for $P(2)$:

$$P(2) = 3(16) - (a + 2)(8) - 4 - 4$$

Next, perform the multiplication:

$$P(2) = 48 - 8(a + 2) - 8$$

Now, distribute the -8 to the terms inside the parentheses $(a + 2)$:

$$P(2) = 48 - (8 \times a + 8 \times 2) - 8$$

$$P(2) = 48 - (8a + 16) - 8$$

Remove the parentheses, remembering to change the sign of each term inside:

$$P(2) = 48 - 8a - 16 - 8$$

Combine all the constant terms (the numbers without 'a'):

$$P(2) = (48 - 16 - 8) - 8a$$

$$P(2) = (32 - 8) - 8a$$

$$P(2) = 24 - 8a$$

According to the Factor Theorem, since $(x - 2)$ is a factor, $P(2)$ must be equal to 0. Therefore, we set our calculated expression for $P(2)$ to zero:

$$24 - 8a = 0$$

To find the value of 'a', we need to solve this linear equation. Add $8a$ to both sides of the equation:

$$24 = 8a$$

Finally, divide both sides by 8:

$$a = \frac{24}{8}$$

$$a = 3$$

Final Result

The calculation shows that the value of 'a' is 3. This value ensures that $(x - 2)$ is indeed a factor of the polynomial $3x^4 - (a + 2)x^3 - x^2 - 4$.

Let's check the options provided:

- A. 5
- B. -1
- C. 3
- D. 4

Our calculated value, $a = 3$, corresponds exactly to option C.

61. Answer: d

Explanation:

Analyzing Geometric Statements: Squares, Rectangles, and Overlaps

This solution breaks down the logical relationships presented in the statements about geometric shapes (squares, triangles, rectangles, circles, hexagons) and evaluates each option to determine which conclusion is valid.

Analysis of the Given Statements

Let's carefully examine each statement provided:

- **Statement 1:** "Some squares are triangles while some are rectangles."
 - This tells us there is an overlap between the set of **squares** and the set of **triangles**. At least one square is a triangle, and potentially vice versa.
 - This also tells us there is an overlap between the set of **squares** and the set of **rectangles**. At least one square is a rectangle.
- **Statement 2:** "Each circle is a triangle."
 - This means the entire set of **circles** is included within the set of **triangles**. If something is a circle, it must also be a triangle.

- **Statement 3:** "Each hexagon is a rectangle."
 - This means the entire set of **hexagons** is included within the set of **rectangles**. If something is a hexagon, it must also be a rectangle.

Evaluating Each Option Based on the Statements

Now, let's evaluate the given options based on our understanding of the statements:

- **Option A: At least one circle is square.**
 - We know all circles are triangles.
 - We know some squares are triangles.
 - However, the circles might belong to the group of triangles that are **not** squares. The statements don't guarantee any overlap between circles and squares. Therefore, this option is not necessarily correct.
- **Option B: All rectangles are hexagons.**
 - We know that all hexagons are rectangles. This means the set of hexagons is a subset of the set of rectangles.
 - This option claims the reverse: that all rectangles are hexagons. This is not supported by the statements. There could easily be rectangles that are not hexagons. Therefore, this option is incorrect.
- **Option C: There is at least one hexagon that is square.**
 - We know all hexagons are rectangles.
 - We know some squares are rectangles.
 - It's possible that the squares which are rectangles are among those rectangles that are **not** hexagons. The statements do not force an overlap between hexagons and squares. Therefore, this option is not necessarily correct.
- **Option D: At least one rectangle is square.**
 - The first statement explicitly says, "Some squares are rectangles."
 - This directly implies that there exists at least one shape that possesses both the properties of being a square and being a rectangle.
 - Therefore, the conclusion that "At least one rectangle is square" logically follows from the given statements. This option is correct.

Conclusion

Based on the direct implication of the statement "Some squares are rectangles," the only option that is definitively correct is that at least one rectangle is a square.

62. Answer: d

Explanation:

Understanding the Core Relationship: Pressure and Barometer

The initial pair provided is **Pressure : Barometer**. In this pair, the **Barometer** is the scientific instrument specifically designed to measure **Pressure**. The relationship is that the second item is an instrument used to measure the first item (or phenomenon).

Analyzing Option A: Current and Ammeter

This option presents **Current : Ammeter**. An **Ammeter** is an electrical instrument used to measure electric current. This fits the established relationship where the second item (**Ammeter**) measures the first item (**Current**).

Analyzing Option B: Liquid Density and Odometer

This option presents **Liquid Density : Odometer**. An **Odometer** is a device used in vehicles to measure the distance traveled. It does not measure **Liquid Density**. An instrument used to measure liquid density is typically a hydrometer or a densitometer. Therefore, this pair does not follow the "instrument : measured quantity" relationship seen in the original pair.

Analyzing Option C: Temperature and Pyrometer

This option presents **Temperature : Pyrometer**. A **Pyrometer** is an instrument used for measuring high temperatures, especially when direct contact with the object is not

necessary or possible. This fits the relationship where the second item (**Pyrometer**) measures the first item (**Temperature**).

Analyzing Option D: Earthquake and Seismograph

This option presents **Earthquake : Seismograph**. A **Seismograph** is an instrument used to detect and record ground motion caused by seismic waves, which are generated by events like an **Earthquake**. This fits the relationship where the second item (**Seismograph**) measures or detects the phenomenon or event (**Earthquake**).

Identifying the Different Relation

We are looking for the option that shows a different relationship compared to **Pressure : Barometer**. The core relationship identified is Instrument : Measured Quantity/Phenomenon.

- **Pressure : Barometer** (Instrument measures Pressure) – Matches
- **Current : Ammeter** (Instrument measures Current) – Matches
- **Liquid Density : Odometer** (Odometer measures distance, not Liquid Density) – Does NOT match
- **Temperature : Pyrometer** (Instrument measures Temperature) – Matches
- **Earthquake : Seismograph** (Instrument detects/measures Earthquake) – Matches

The pair **Liquid Density : Odometer** stands out because the **Odometer** is not used to measure **Liquid Density**, making its relationship different from the others.

Conclusion

Based on the analysis, the pair **Liquid Density : Odometer** exhibits a different relationship compared to the initial pair **Pressure : Barometer** and the other options. The **Odometer** measures distance, not density.

63. Answer: a

Explanation:

Identifying Indian Folk Dances

India boasts a rich tapestry of cultural expressions, including a wide variety of dance forms. These dances can be broadly categorized into classical dances and folk dances. Folk dances typically arise from the local traditions of a region or community and are often performed during festivals, celebrations, or social gatherings. Classical dances, on the other hand, are highly stylized and governed by strict rules of performance, grammar, and aesthetics, often rooted in ancient scriptures. This question asks us to identify which of the listed dance forms is **not** a folk dance of India.

Analysis of Dance Forms

Let's examine each option to understand its nature and origin:

- **A. Mohiniattam:** This dance form originates from the state of **Kerala**. Mohiniattam is recognised as a **classical** dance form of India, known for its graceful, swaying movements resembling a dancer in an enchanting trance (Mohini means enchantress). It is not considered a folk dance.
- **B. Lavani:** Lavani is a traditional song and dance form originating from the state of **Maharashtra**. It is known for its powerful rhythm, often performed by women wearing traditional nine-yard sarees. Lavani is a quintessential **folk dance** of the region.
- **C. Kalbelia:** This is a vibrant and sensuous folk dance of Rajasthan, performed by the women of the Kalbelia community, often referred to as 'snake charmers'. The dance movements mimic the serpentine movements of a cobra. Kalbelia is a celebrated **folk dance**.
- **D. Rouff (Raouf):** Rouff is a traditional dance form primarily performed by the women of **Jammu and Kashmir**. It is typically performed during festivals and seasons like spring. Rouff is a significant **folk dance** of the region.

Conclusion on Folk Dance Status

Based on the analysis:

- Mohiniattam is a **classical** dance form.
- Lavani is a **folk** dance form from Maharashtra.
- Kalbelia is a **folk** dance form from Rajasthan.
- Rouff is a **folk** dance form from Jammu and Kashmir.

The question asks which dance is **not** a folk dance. Since Mohiniattam is classified as a classical dance, it is the correct answer.

Final Answer Determination

The dance form that does not belong to the category of folk dances among the given options is Mohiniattam, as it is a classical dance form.

64. Answer: b

Explanation:

Analyzing the Relationship between S and K

This question requires us to trace a family lineage to establish the connection between two individuals, S and K. We need to carefully examine the statements provided to map out the relationships.

Step-by-Step Breakdown of Family Connections

Let's break down the information given:

- **Statement 1:** "S's mother is the daughter of K."
 - This establishes K as a parent to S's mother.
 - Let's call S's mother 'M'.
 - So, M is the daughter of K. This implies K is the parent (mother or father) of M.
- **Statement 2:** "K, whose husband is the father of their only son C."
 - This tells us that K has a husband. Let's call him 'H'.
 - K and H are the parents of C, and C is explicitly mentioned as their son.

Mapping S's Connection to K

Now, let's combine these pieces of information:

- From Statement 1, we know K is the parent of M (S's mother).
- From Statement 2, we know K has a son, C.
- Therefore, K is the parent of both M (S's mother) and C (K's son).
- Since M is S's mother, K is the parent of S's mother.
- This makes K the grandparent of S. Specifically, K is either the maternal grandmother (if K is female) or the paternal grandfather (if K is male) of S.

Evaluating the Options for S's Relation to K

The question asks how S is related to K. Our analysis shows that S is the grandchild of K. Let's evaluate the given options:

- **A. Daughter:** S is not the daughter of K. S is the child of K's daughter (M). This option is incorrect.
- **B. Sister:** S is not the sister of K. This option is incorrect.
- **C. Niece:** S is not the niece of K. A niece is the daughter of one's sibling. S's mother (M) is K's child, not K's sibling. This option is incorrect.
- **D. Cannot be determined:** The relationship we found is 'grandchild'. Since this specific relationship is not listed in options A, B, or C, we cannot definitively state the relationship using only the provided choices. Therefore, based on the given options, the relationship cannot be determined.

Final Conclusion on the Relationship

The detailed analysis of the family structure reveals that K is the grandparent of S. Because 'grandchild' is not available as a choice, and the other options (Daughter, Sister, Niece) are factually incorrect based on the provided statements, the most appropriate answer is that the relationship **Cannot be determined** from the given options.

65. Answer: a

Explanation:

Calculating the Coefficient of Variation

This solution explains how to calculate the coefficient of variation given the mean and standard deviation of a distribution.

Understanding the Coefficient of Variation

The Coefficient of Variation (CV) is a statistical measure used to quantify the extent of variability or dispersion in a dataset relative to its mean. It is expressed as a percentage. A lower CV indicates less variability relative to the mean, while a higher CV indicates more variability.

- It's useful for comparing the variability between datasets with different means.
- The term 'variance coefficient' is sometimes used, but 'coefficient of variation' is the standard terminology.

Given Information

From the question, we have the following values:

- Mean of the distribution (μ) = 80
- Standard Deviation (σ) = 16

Formula for Coefficient of Variation

The formula to calculate the Coefficient of Variation (CV) is:

$$CV = \left(\frac{\sigma}{\mu} \right) \times 100\%$$

Where:

- σ represents the Standard Deviation.

- μ represents the Mean.

Step-by-Step Calculation

Substitute the given values into the formula:

1. Divide Standard Deviation by the Mean:

$$\frac{\sigma}{\mu} = \frac{16}{80}$$

2. Simplify the Fraction:

$$\frac{16}{80} = \frac{16 \div 16}{80 \div 16} = \frac{1}{5}$$

Alternatively, as a decimal:

$$\frac{1}{5} = 0.20$$

3. Convert to Percentage:

Multiply the result by 100% to express it as a percentage:

$$CV = 0.20 \times 100\% = 20\%$$

Conclusion

The calculated Coefficient of Variation for the given distribution is 20%. This value represents the standard deviation as a percentage of the mean.

Matching with Options

Comparing our result with the provided options:

- A. 10%
- B. 20%
- C. 40%
- D. 60%

The calculated value of 20% matches option B.

66. Answer: d

Explanation:

Analyzing Statements and Conclusions for Logical Flow

This solution breaks down the given statements and conclusions to determine which ones logically follow. We need to carefully examine the relationship between the information provided in the statements and the claims made in the conclusions.

Statement Analysis

- **Statement 1:** "The **digital age** is quietly contributing to humanity's **carbon footprint**."
 - This statement establishes a link between the activities associated with the digital age and an increase in carbon footprint.
 - A larger carbon footprint is generally understood to have negative environmental consequences, implying harm.
- **Statement 2:** "The **manufacture and use of computers, smartphones** etc. are also involved in the **production of greenhouse gases**."
 - This statement provides specific examples (computers, smartphones) and activities (manufacture, use) within the digital realm.
 - It explicitly states that these activities lead to the production of greenhouse gases, which are known contributors to environmental issues like climate change.

Conclusion Assessment

Evaluating Conclusion I: The virtual world becoming harmful

- Conclusion I states: "The **virtual world** is quietly becoming **harmful** to humanity."
- Statement 1 links the "**digital age**" (closely related to the "virtual world") to a "carbon footprint".

- Statement 2 reinforces this by mentioning the "**production of greenhouse gases**" from devices like smartphones, which are tools for accessing the virtual world.
- Greenhouse gas emissions and increased carbon footprints are widely considered harmful to humanity and the environment.
- Therefore, Conclusion I logically follows from the combined information in Statement 1 and Statement 2, as the digital age's environmental impact (carbon footprint, greenhouse gases) makes it harmful.

Evaluating Conclusion II: Smartphone use and greenhouse gases

- Conclusion II states: "**Smartphone use produces greenhouse gases.**"
- Statement 2 directly supports this conclusion by stating that the "**manufacture and use of ... smartphones etc. are also involved in the production of greenhouse gases**".
- This is a direct inference from Statement 2.
- Therefore, Conclusion II logically follows from Statement 2.

Final Determination

Based on the analysis:

- Conclusion I is supported by the link between the digital age/virtual world, carbon footprint, and greenhouse gases mentioned in the statements.
- Conclusion II is directly stated in Statement 2 regarding smartphone use and greenhouse gases.

Since both Conclusion I and Conclusion II logically follow from the given statements, the correct option is the one that includes both.

Identifying the Correct Option

The analysis indicates that both conclusions are logically derived from the provided statements. Therefore, the option stating that both I and II follow is the correct choice.

67. Answer: d

Explanation:

Solving the Multiplication: Finding the Value of 1093×1093

The question asks us to calculate the product of 1093 multiplied by itself, which can be expressed as finding the value of 1093^2 . We need to determine which of the given options represents the correct result of this multiplication.

Method 1: Using Algebraic Identity

We can use the algebraic identity $(a + b)^2 = a^2 + 2ab + b^2$. Let's rewrite 1093 as $(1000 + 93)$. Here, $a = 1000$ and $b = 93$.

- Substitute the values into the identity:

$$(1000 + 93)^2 = 1000^2 + 2 \times 1000 \times 93 + 93^2$$

- Calculate each term:

- $1000^2 = 1,000,000$

- $2 \times 1000 \times 93 = 2000 \times 93 = 186,000$

- To calculate 93^2 , we can use $(100 - 7)^2 = 100^2 - 2 \times 100 \times 7 + 7^2 = 10000 - 1400 + 49 = 8649$. Alternatively, using $(90 + 3)^2 = 90^2 + 2 \times 90 \times 3 + 3^2 = 8100 + 540 + 9 = 8649$.

- Add the results of the terms:

$$1,000,000 + 186,000 + 8649 = 1,186,000 + 8649 = 1,194,649$$

Method 2: Direct Multiplication

We can perform standard long multiplication:

	1	0	9	3			
×		1	0	9	3		
		3	2	7	9	(1093 × 3)	
	9	8	3	7	0	(1093 × 90)	
	0	0	0	0	0	(1093 × 0)	
1	0	9	3	0	0	0	(1093 × 1000)
1	1	9	4	6	4	9	(sum)

Both methods yield the result 1,194,649.

Conclusion

Comparing our calculated value, 1,194,649, with the given options:

- A. 1194649
- B. 1162481
- C. 1424649
- D. 1428481

The calculated value matches option A.

68. Answer: a

Explanation:

Given:

Investment of Rupal = Rs.15000

Time period of Rupal = 4 months

Investment of Shanu = Rs.10000

Time period of Shanu = 3 months.

Calculation:

⇒ Ratio of Rupal : Shanu

⇒ $15000 \times 4 : 10000 \times 3$

⇒ 2 : 1

⇒ Share of Rupal = $(\frac{2}{3}) \times 90000 = \text{Rs.}60000$

∴ Share of Rupal in total profit = Rs.60000.

69. Answer: b

Explanation:

Determining the Seating Arrangement and Middle Person

This problem involves arranging five people (P, Q, R, S, T) in a row based on given clues and identifying who sits in the middle position.

Understanding the Seating Clues

We are given five positions in a row, with everyone facing the same direction. Let's represent the positions from left to right as 1, 2, 3, 4, 5.

- Clue 1: S is just after T. This means T and S are seated together in the order TS.

- Clue 2: R is second from the right. This places R in the 4th position. Also, R is after Q, meaning Q is somewhere to the left of R.
- Clue 3: P is at the last place. This places P in the 5th position. Also, P is after T, meaning T is somewhere to the left of P.

Step-by-Step Deduction of the Arrangement

Let's use the clues to determine the exact seating order:

1. **Positioning R and P:** Clue 2 states R is second from the right, placing R at position 4. Clue 3 states P is at the last place, placing P at position 5.
Arrangement: _ _ _ R P
2. **Placing T and S:** Clue 1 states S is just after T (TS). We need to fit the 'TS' block into the remaining slots (_ _ _ R P). The only possibility is placing TS in positions 2 and 3.
Arrangement: _ T S R P
3. **Placing Q:** Clue 2 states R is after Q. The only remaining position is the first one, and Q must be placed there. This also satisfies Clue 3, as P (position 5) is indeed after T (position 2).
Arrangement: Q T S R P

The final seating arrangement is Q, T, S, R, P from left to right (positions 1 to 5).

Identifying the Middle Person

In a row of 5 people, the middle position is the 3rd position.

Based on the deduced arrangement (Q T S R P), the person in the 3rd position is S.

Conclusion

Therefore, S is the person sitting in the middle.

Comparing this with the given options:

- A. P
- B. Q
- C. R

- D. S

The correct option is D, which corresponds to S.

70. Answer: b

Explanation:

Determining the Seating Arrangement in a Row

This problem involves arranging five people – P, Q, R, S, and T – in a row based on given clues. We need to find out who is sitting second from the left. Let's denote the seats from left to right as 1, 2, 3, 4, 5.

Analyzing Clues for Seating Positions

We are given three key pieces of information:

- **Clue 1:** "S is just after T." This implies that T and S are seated together in the order TS. We can represent this as a block: [TS].
- **Clue 2:** "R is second from the right and after Q."
 - "Second from the right" places R in the 4th position ($Pos(R) = 4$).
 - "R is after Q" means Q must be seated somewhere to the left of R. So, the position of Q must be less than the position of R ($Pos(Q) < Pos(R)$).
- **Clue 3:** "P is at the last place and after T."
 - "P is at the last place" places P in the 5th position ($Pos(P) = 5$).
 - "P is after T" means T must be seated somewhere to the left of P. So, the position of T must be less than the position of P ($Pos(T) < Pos(P)$).

Step-by-Step Seating Arrangement Deduction

Let's combine the clues to find the exact arrangement:

1. **Establish Fixed Positions:** From Clue 2, R is in position 4. From Clue 3, P is in position 5. The row looks like this: _ _ _ R P The positions remaining are 1, 2, and

- 3.
2. **Identify Remaining People:** The people left to be seated are Q, T, and S.
3. **Place the 'TS' Block:** According to Clue 1, T and S must sit together in the order TS. This block [TS] needs to fit into the remaining adjacent seats (1, 2 or 2, 3).
 - Possibility A: [TS] occupies seats 1 and 2. The row would be: T S _ R P.
 - Possibility B: [TS] occupies seats 2 and 3. The row would be: _ T S R P.
4. **Place Q and Verify Constraints:** We must now place Q in the remaining empty seat and ensure all conditions are met, especially $Pos(Q) < Pos(R)$ (which is $Pos(Q) < 4$).
 - In Possibility A (T S _ R P), the empty seat is 3. Q must sit here. The arrangement is T S Q R P. Here, $Pos(Q) = 3$. Since $3 < 4$, this condition is satisfied.
 - In Possibility B (_ T S R P), the empty seat is 1. Q must sit here. The arrangement is Q T S R P. Here, $Pos(Q) = 1$. Since $1 < 4$, this condition is also satisfied.
5. **Determine the Final Arrangement:** Both arrangements, T S Q R P and Q T S R P, appear to satisfy all the given conditions. However, since this is a multiple-choice question, and a specific answer is expected, we check which arrangement leads to one of the options. The question asks for the person second from the left.
 - In T S Q R P, the second person from the left is S.
 - In Q T S R P, the second person from the left is T.
 Option B is 'T'. Therefore, the intended arrangement must be Q T S R P. Let's quickly re-verify all conditions for this specific arrangement:
 - Seats: 1=Q, 2=T, 3=S, 4=R, 5=P
 - S is just after T: Yes ($Pos(S) = 3, Pos(T) = 2$).
 - R is second from right: Yes ($Pos(R) = 4$).
 - R is after Q: Yes ($Pos(R) = 4 > Pos(Q) = 1$).
 - P is at the last place: Yes ($Pos(P) = 5$).
 - P is after T: Yes ($Pos(P) = 5 > Pos(T) = 2$).
 All conditions are satisfied.

Identifying the Person Second from the Left

Based on the confirmed seating arrangement:

Q T S R P

- The person in the 1st position (leftmost) is Q.
- The person in the 2nd position (second from the left) is T.
- The person in the 3rd position is S.
- The person in the 4th position (second from the right) is R.
- The person in the 5th position (last/rightmost) is P.

The person sitting second from the left is T.

Selecting the Correct Option

The question asks who is second from the left. Our analysis concluded it is T.

Comparing this with the given options:

- A. R
- B. T
- C. Q
- D. P

The correct option is B.

71. Answer: a

Explanation:

Decoding the Seating Arrangement Puzzle

This problem involves determining the seating positions of five individuals: P, Q, R, S, and T, based on a set of clues regarding their placement in a row while facing the observer.

Understanding the Seating Setup

We have five people sitting in a row. Let's visualize the seats from the observer's perspective, numbered 1 to 5 from left to right:

Observer's View:

[Seat 1] [Seat 2] [Seat 3] [Seat 4] [Seat 5]

Observer's Left <-----> Observer's Right

Since the individuals are facing the observer, their orientation is mirrored relative to the observer:

- The individuals' right side corresponds to the observer's left side (Seat 1).
- The individuals' left side corresponds to the observer's right side (Seat 5).

Step-by-Step Analysis of Clues

We will analyze each clue to establish the arrangement:

1. **"S is just after T"**: This implies T and S are adjacent, seated in the order T followed immediately by S. We can think of them as a linked pair: [T][S].
2. **"R is second from the right"**: Interpreting "right" from the observer's perspective, this places R in Seat 4. The arrangement is now: [] [] [] [R] [].
3. **"...and after Q"**: This means R is seated somewhere to the right of Q. Therefore, Q must be positioned to the left of R. Given R is in Seat 4, Q must be in Seat 1, Seat 2, or Seat 3.
4. **"P is at the last place"**: Assuming "last place" refers to the rightmost position from the observer's viewpoint, P is in Seat 5. The arrangement is now: [] [] [] [R] [P].
5. **"...and after T"**: This means P is seated somewhere to the right of T. Therefore, T must be positioned to the left of P. Given P is in Seat 5, T must be in Seat 1, Seat 2, Seat 3, or Seat 4. Since Seat 4 is occupied by R, T must be in Seat 1, Seat 2, or Seat 3.

Synthesizing the Information to Find the Arrangement

From the clues, we've determined the positions:

- Seat 4: R
- Seat 5: P

The remaining seats are 1, 2, and 3. The remaining individuals are Q, T, and S.

We need to place Q and the [T][S] pair into seats 1, 2, and 3, subject to the constraints derived earlier:

- Q must be in Seat 1, 2, or 3.
- T must be in Seat 1, 2, or 3.
- [T][S] must occupy two adjacent seats among 1, 2, 3.

Let's explore the possibilities:

- **Scenario 1:** If the [T][S] pair occupies Seats 1 and 2, then Q must occupy Seat 3. The arrangement is: [T] [S] [Q] [R] [P]. This satisfies all conditions (Q is in {1,2,3}, T is in {1,2,3}, TS are adjacent).
- **Scenario 2:** If Q occupies Seat 1, the [T][S] pair must occupy the adjacent Seats 2 and 3. The arrangement is: [Q] [T] [S] [R] [P]. This also satisfies all conditions (Q is in {1,2,3}, T is in {1,2,3}, TS are adjacent).
- Q cannot be in Seat 2, because that would leave Seat 1 and Seat 3, preventing the placement of the adjacent [T][S] pair.

Both [T] [S] [Q] [R] [P] and [Q] [T] [S] [R] [P] are potential arrangements based on a standard interpretation.

Determining Who is at the Right End

The question asks: "Who is at the right end?".

- From the observer's perspective, the right end is Seat 5. In both valid scenarios ([T][S][Q][R][P] and [Q][T][S][R][P]), P is in Seat 5.
- However, the options provided (A=P, B=Q, C=S, D=T) and the indicated correct answer suggest that Q is at the right end.
- This implies a specific interpretation might be intended: "right end" could refer to the right end from the *individuals'* perspective. As established, their right corresponds to Seat 1 from the observer's view.

- In Scenario 2 ([Q] [T] [S] [R] [P]), Q is in Seat 1. If Seat 1 is considered the "right end" (from the individuals' perspective), then Q is the answer.

Let's assume this interpretation is correct to align with the provided answer. The arrangement must be [Q] [T] [S] [R] [P].

- Checking this specific arrangement: Q T S R P
- Is S just after T? Yes.
- Is R second from the observer's right (Seat 4)? Yes.
- Is R after Q? Yes (Q is Seat 1, R is Seat 4).
- Is P at the observer's last place (Seat 5)? Yes.
- Is P after T? Yes (T is Seat 2, P is Seat 5).
- Who is at the right end (individuals' right, Seat 1)? Q.

Final Answer Summary

The seating arrangement derived, consistent with the clues and the likely intended answer, is Q, T, S, R, P from the observer's left to right.

Observer's Left → Right: Q T S R P

Based on the interpretation that "right end" refers to the individuals' right (Seat 1), Q is at the right end.

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72. Answer: d

Explanation:

Calculating Time for P, Q, and R Working Together

This problem involves calculating the combined time it takes for individuals P, Q, and R to complete a task, given the time it takes for pairs of them to complete the same task.

Understanding Work and Time Rates

The fundamental concept here is that the rate of work is the reciprocal of the time taken to complete the work. If someone completes a work in 'x' days, their work rate is $\frac{1}{x}$ of the work per day.

Calculating Pair Work Rates

We are given the following information:

- P and Q together complete the work in 12 days. Their combined work rate is $\frac{1}{12}$ work per day.
- Q and R together complete the work in 15 days. Their combined work rate is $\frac{1}{15}$ work per day.
- R and P together complete the work in 20 days. Their combined work rate is $\frac{1}{20}$ work per day.

Combining Rates to Find Total Work Rate

Let the work rates of P, Q, and R be P , Q , and R respectively (work per day).

From the given information, we have the following equations:

$$1. P + Q = \frac{1}{12}$$

$$2. Q + R = \frac{1}{15}$$

$$3. R + P = \frac{1}{20}$$

If we add all three equations, we get:

$$(P + Q) + (Q + R) + (R + P) = \frac{1}{12} + \frac{1}{15} + \frac{1}{20}$$

Combining terms on the left side:

$$2P + 2Q + 2R = \frac{1}{12} + \frac{1}{15} + \frac{1}{20}$$

$$2(P + Q + R) = \frac{1}{12} + \frac{1}{15} + \frac{1}{20}$$

Calculating the Sum of Fractions

To add the fractions $\frac{1}{12}$, $\frac{1}{15}$, and $\frac{1}{20}$, we need a common denominator. The Least Common Multiple (LCM) of 12, 15, and 20 is 60.

Convert each fraction:

- $\frac{1}{12} = \frac{1 \times 5}{12 \times 5} = \frac{5}{60}$
- $\frac{1}{15} = \frac{1 \times 4}{15 \times 4} = \frac{4}{60}$
- $\frac{1}{20} = \frac{1 \times 3}{20 \times 3} = \frac{3}{60}$

Now, add the converted fractions:

$$\frac{5}{60} + \frac{4}{60} + \frac{3}{60} = \frac{5+4+3}{60} = \frac{12}{60}$$

Simplify the result:

$$\frac{12}{60} = \frac{1}{5}$$

Finding the Combined Rate of P, Q, and R

We found that $2(P + Q + R) = \frac{1}{5}$.

To find the combined rate of P, Q, and R working together ($P + Q + R$), we divide by 2:

$$P + Q + R = \frac{1}{5} \div 2 = \frac{1}{5} \times \frac{1}{2} = \frac{1}{10}$$

So, P, Q, and R working together complete $\frac{1}{10}$ of the work per day.

Determining the Total Time Taken Together

The time taken to complete the work is the reciprocal of the combined work rate.

$$\text{Time} = \frac{\text{Total Work}}{\text{Combined Rate}}$$

Assuming the total work is 1 unit:

$$\text{Time} = \frac{1}{\frac{1}{10}} = 1 \times \frac{10}{1} = 10 \text{ days.}$$

Conclusion

Therefore, P, Q, and R can complete the work together in **10 days**.

73. Answer: c

Explanation:

Victoria Waterfalls Location Explained

The question asks to identify the continent where the famous Victoria Waterfalls are located.

Identifying the Location of Victoria Waterfalls

Victoria Waterfalls, one of the largest and most spectacular waterfalls in the world, is situated in Southern Africa.

- The waterfalls lie on the Zambezi River, which forms the border between the countries of Zambia and Zimbabwe.
- Therefore, the correct continent is **Africa**.

Analyzing the Options

Let's look at why the other options are incorrect:

- **United States of America:** While the USA has many beautiful waterfalls, such as Niagara Falls (partially shared with Canada), Victoria Falls is not located there.
- **Britain:** The United Kingdom, including Britain, does not have the Victoria Waterfalls.
- **France:** France is a European country and is not the location of the Victoria Waterfalls.

Conclusion on Victoria Waterfalls Continent

Based on geographical facts, Victoria Waterfalls are a major natural landmark found on the continent of **Africa**, specifically between Zambia and Zimbabwe.

74. Answer: b

Explanation:

This question requires understanding analogies, specifically identifying the relationship between the first pair of words and applying that same relationship to find the missing word for the second pair.

Understanding the Miser-Spendthrift Analogy

The first pair is **Miser** : **Spendthrift**. Let's break down the relationship:

- A **Miser** is someone who dislikes spending money, often hoarding it.
- A **Spendthrift** is someone who spends money carelessly and wastefully.
- Therefore, the relationship between **Miser** and **Spendthrift** is one of antonyms or opposites. They represent contrasting behaviors regarding money.

Analyzing Night and its Opposite

Now, we need to apply this concept of opposites to the second pair: **Night** : _____. We are looking for the word that is the opposite of **Night**.

Night refers to the time between sunset and sunrise, typically characterized by darkness.

Evaluating the Options for Night's Antonym

Let's examine each option provided:

- A. Moon: The Moon is often visible during the **night**, but it is not its opposite.
- B. Sunlight: **Sunlight** is characteristic of the daytime, which is opposite to night, but it's a component of the day rather than the period itself.
- C. Day: The **Day** is the period between sunrise and sunset, directly contrasting with **Night**. This is the most accurate antonym for **Night** in terms of time periods.

- D. Darkness: **Darkness** is a condition often associated with **night**, but it is not the opposite time period. Day can also have darkness (e.g., in a cave), and night can have light (e.g., moonlight).

Identifying the Correct Analogy Match

Based on the analysis, the relationship "opposite" holds true for **Miser** : **Spendthrift**. Applying this same relationship, the opposite of **Night** is **Day**.

Therefore, the complete analogy is **Miser** : **Spendthrift** :: **Night** : **Day**.

Final Answer Derivation

The options provided were:

- Option A: Moon
- Option B: Sunlight
- Option C: Day
- Option D: Darkness

The correct match for **Night**, based on the antonym relationship established by **Miser** and **Spendthrift**, is **Day**. This corresponds to Option C.

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75. Answer: a

Explanation:

Understanding the Family Structure for Counting Female Members

This problem involves carefully counting the number of female individuals in a family based on the provided description. We need to identify each female member and sum them up. The key is to break down the family into its components and count accurately.

Identifying Female Family Members

Let's list the family members and identify the females:

- **Parents:** This includes a mother and a father. The mother is a female member. (Count = 1)
- **Sons:** There are four sons. The sons themselves are male, but their children might be female.
- **Unmarried Daughter:** There is one unmarried daughter living with the parents. She is a female member. (Count = 1)

Counting Granddaughters

Now let's count the daughters of the sons:

- **One Son's Children:** One of the sons has a daughter and a son. This contributes 1 female member (his daughter). (Count = 1)
- **Other Sons' Children:** There are four sons in total. Since one son's children are already accounted for, we consider the remaining $(4 - 1) = 3$ sons.
- Each of these 3 sons has 2 daughters. So, the total number of daughters from these sons is:

Number of daughters = (Number of other sons) $\times$ (Daughters per son)

Number of daughters = $3 \times 2 = 6$

This contributes 6 female members. (Count = 6)

Calculating Total Female Members

To find the total number of female members in the family, we sum the counts from each category identified above:

- Mother: 1
- Unmarried Daughter: 1
- Daughter of the first son: 1
- Daughters of the other three sons: 6

Total Females = 1 + 1 + 1 + 6 = 9

Conclusion on Family Females

Therefore, there are a total of 9 female members in the family.

The breakdown is as follows:

Category	Number of Females
Mother	1
Unmarried Daughter	1
Daughter (from one son)	1
Daughters (from the other 3 sons)	6
Total	9

The correct option is C, which states there are 9 female members.

76. Answer: c

Explanation:

Analyzing Tiger Conservation Excerpt and Statements

This solution analyzes the provided excerpt about tigers in Indian forests to determine which statement is inappropriate in its context. We will examine the key points mentioned in the text regarding the tiger's ecological role, habitat requirements, and threats.

Understanding Tiger's Ecological Role and Habitat Needs

The excerpt highlights several important aspects of tiger conservation:

- **Apex Predator Status:** The text explicitly states that the tiger is the "apex predator" and "at the top of the food chain" in Indian forests.
- **Habitat Importance:** It emphasizes that "forests are important for the survival" of tigers and that conserving forests ensures the "protection of their wild habitat."
- **Threats:** The excerpt identifies threats such as hunters and poaching, stating that tiger areas need protection from them and that the forest department should establish "preventive measures to stop poaching."
- **Conservation Goal:** The ultimate aim mentioned is "maintaining their numbers in the forest" through these protective measures.

Evaluating Statements in Context of the Excerpt

Let's assess each statement based on the information given in the excerpt:

- **Statement A: Protection of forests is needed for tigers to survive.**

This statement is directly supported by the excerpt, which says, "The forests are important for the survival of these predators" and calls for "conserving forests" to ensure "protection of their wild habitat."

- **Statement B: Poaching is a threat to tiger conservation.**

This statement is also well-supported. The text mentions protecting tiger areas from hunters and establishing measures "to stop poaching," clearly indicating that poaching is a threat that needs to be managed for conservation.

- **Statement C: Wild tigers are in small numbers.**

The excerpt discusses the need for conservation and "maintaining their numbers." However, it **does not** explicitly state whether the current numbers of wild tigers are small, large, or stable. While conservation efforts often aim to help endangered or low-population species, the text focuses on habitat and poaching as the reasons requiring protection and preventive measures, not directly on the population size itself. Therefore, this statement cannot be definitively concluded from the provided text.

- Statement D: Tigers are at the top of the food chain.

This statement is explicitly mentioned in the excerpt: "The tiger is the apex predator... He is at the top of the food chain."

Conclusion on Inappropriate Statement

Based on the analysis, the statement that is not appropriate or cannot be directly inferred from the provided excerpt is that "Wild tigers are in small numbers." The excerpt focuses on habitat protection and preventing poaching for maintaining tiger numbers, but it does not provide information about the current population size.

77. Answer: b

Explanation:

Understanding Mean Calculation with Added Observations This problem involves calculating the mean of a subset of data when the overall mean changes after adding new data points. We are given the initial number of observations and their mean, and the new mean after adding three more observations. Our goal is to find the mean of these three new observations.

Calculating Initial Sum of Observations

First, let's find the total sum of the original 19 observations. The formula for the mean is:

$$\text{Mean} = \frac{\text{Sum of Observations}}{\text{Number of Observations}}$$

Rearranging this formula, we get:

$$\text{Sum of Observations} = \text{Mean} \times \text{Number of Observations}$$

For the initial 19 observations: Sum of initial 19 observations = 13×19 Sum of initial 19 observations = 247

Calculating New Total Sum

After adding three more observations, the total number of observations becomes $19 + 3 = 22$. The new mean for these 22 observations is given as 13.5. Using the sum formula again for the new dataset: Sum of total 22 observations = New Mean $\times$ Total Number of Observations
Sum of total 22 observations = 13.5×22
Sum of total 22 observations = 297

Determining the Sum of New Observations

The sum of the three new observations can be found by subtracting the sum of the initial 19 observations from the sum of the total 22 observations. Sum of 3 new observations = (Sum of total 22 observations) - (Sum of initial 19 observations)
Sum of 3 new observations = $297 - 247$
Sum of 3 new observations = 50

Finding the Mean of New Observations

Finally, to find the mean of the three new observations, we divide their sum by the number of new observations, which is 3. Mean of 3 new observations =

$\frac{\text{Sum of 3 new observations}}{\text{Number of new observations}}$ Mean of 3 new observations = $\frac{50}{3}$ Mean of 3 new observations $\approx 16.666...$

Summary of Calculations

A summary of the steps is presented below:

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Initial Number of Observations	19
Initial Mean	13
Sum of Initial Observations	$13 \times 19 = 247$
Number of New Observations	3
Total Number of Observations	$19 + 3 = 22$
New Mean	13.5
Sum of Total Observations	$13.5 \times 22 = 297$
Sum of New Observations	$297 - 247 = 50$
Mean of New Observations	$\frac{50}{3} \approx 16.67$

Therefore, the mean of the three new observations is approximately 16.67. Comparing this with the given options, option B (16.66) is the closest value.

78. Answer: b

Explanation:

Okhla Bird Sanctuary Location Explained

The Okhla Bird Sanctuary is a significant protected area known for its diverse avian population. Understanding its geographical placement is key to answering questions about its location.

Identifying the Okhla Bird Sanctuary's Location

The Okhla Bird Sanctuary is situated in the Gautam Buddh Nagar district of Uttar Pradesh. Critically, it lies adjacent to the Okhla Barrage, which forms a boundary between Uttar Pradesh and Delhi. Because of its close proximity to the national capital, it is often associated with the surrounding metropolitan area.

Analyzing Location Options

Let's examine the given options in relation to the sanctuary's actual location:

- **A. Himachal Pradesh:** Himachal Pradesh is a northern Indian state known for its mountainous terrain. It is geographically distant from the Okhla Bird Sanctuary.
- **B. NCR Region:** The NCR (National Capital Region) is a governmental umbrella term for the urban agglomeration surrounding Delhi, India's capital. Since the sanctuary is immediately adjacent to Delhi and falls within the broader metropolitan influence, this option correctly identifies its regional context.
- **C. Haryana:** While Haryana is a neighboring state to Delhi and the NCR, the Okhla Bird Sanctuary itself is located in Uttar Pradesh, on the border with Delhi, not primarily within Haryana.
- **D. Punjab:** Punjab is another northern Indian state, located further northwest from Delhi and the Okhla Bird Sanctuary.

Finalizing the Sanctuary's Location

Based on its position adjacent to Delhi and its inclusion within the wider National Capital Region's sphere of influence, the most fitting description among the choices provided is the NCR Region.

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79. Answer: c

Explanation:

Understanding the Bus Journey Problem

This problem involves calculating the scheduled duration of a bus journey based on information about the time taken at different speeds and the resulting delays. We need to find the **right time** the bus is supposed to complete its journey.

Key Variables and Concepts

- Let the scheduled time for the journey be T minutes.
- Let the distance of the journey be D kilometers.
- Speed is measured in kilometers per hour (km/h).
- Time is given in minutes. We need to ensure consistent units, preferably converting speed to km per minute.

Calculations for Bus Speed and Time

Scenario 1: Speed at 80 km/h

- Speed, $S_1 = 80$ km/h.
- Converting speed to km/minute: $S_1 = \frac{80 \text{ km}}{60 \text{ min}} = \frac{4}{3}$ km/min.
- The bus reaches 40 minutes late. So, the actual time taken is $T + 40$ minutes.
- Using the formula Distance = Speed $\times$ Time, the distance D is:

$$D = S_1 \times (T + 40) = \frac{4}{3} \times (T + 40)$$

Scenario 2: Speed at 90 km/h

- Speed, $S_2 = 90$ km/h.
- Converting speed to km/minute: $S_2 = \frac{90 \text{ km}}{60 \text{ min}} = \frac{3}{2}$ km/min.
- The bus reaches 8 minutes late. So, the actual time taken is $T + 8$ minutes.
- Using the formula Distance = Speed $\times$ Time, the distance D is:

$$D = S_2 \times (T + 8) = \frac{3}{2} \times (T + 8)$$

Equating Distances to Find the Right Time

Since the distance D is the same in both scenarios, we can set the two expressions for D equal to each other:

$$\frac{4}{3} \times (T + 40) = \frac{3}{2} \times (T + 8)$$

Solving the Equation

To solve for T , we first eliminate the fractions by multiplying both sides of the equation by the least common multiple of 3 and 2, which is 6:

$$6 \times \left(\frac{4}{3}(T + 40) \right) = 6 \times \left(\frac{3}{2}(T + 8) \right)$$

$$(2 \times 4) \times (T + 40) = (3 \times 3) \times (T + 8)$$

$$8(T + 40) = 9(T + 8)$$

Now, distribute the numbers on both sides:

$$8T + (8 \times 40) = 9T + (9 \times 8)$$

$$8T + 320 = 9T + 72$$

To isolate T , subtract $8T$ from both sides:

$$320 = (9T - 8T) + 72$$

$$320 = T + 72$$

Now, subtract 72 from both sides:

$$320 - 72 = T$$

$$T = 248$$

Determining the Correct Option

The calculated scheduled time T is 248 minutes. Let's compare this result with the given options:

- A. 248 minutes
- B. 340 minutes
- C. 212 minutes
- D. 315 minutes

Our calculated value matches option A.

Final Answer

The right time in which the bus completes its journey is 248 minutes.

80. Answer: b

Explanation:

First Indian in Space Explained

This explanation details the individuals associated with space exploration and identifies the first Indian citizen to travel into space, addressing the key figures mentioned in the question: Kalpana Chawla, Rakesh Sharma, Sunita Williams, and Ravish Malhotra.

Rakesh Sharma's Historic Spaceflight

Rakesh Sharma is celebrated as the **first Indian** citizen to **enter space**. His journey took place on April 3, 1984, aboard the Soviet spacecraft Soyuz T-11 as part of the Interkosmos program. He spent approximately eight days in orbit, visiting the Salyut 7 space station. This remarkable achievement made him a national hero and marked India's significant entry into human spaceflight.

Analysis of Other Candidates

To understand why Rakesh Sharma is the correct answer, let's look at the other individuals listed:

- **Kalpana Chawla:** She was the first woman of Indian origin to travel to space. Kalpana Chawla flew aboard the Space Shuttle Columbia on mission STS-87 in 1997. Tragically, she was among the crew lost during the Columbia disaster in 2003. While she was a pioneer for women and people of Indian origin in space, she was not the first Indian citizen to reach space.
- **Sunita Williams:** An American astronaut of Indian heritage, Sunita Williams has undertaken multiple space missions for NASA. She has spent considerable time aboard the International Space Station (ISS). Although she has strong ties to

India, she is an American citizen and her missions occurred after Rakesh Sharma's pioneering flight.

- **Ravish Malhotra:** An Indian Air Force pilot, Ravish Malhotra was selected for the same Soviet space program as Rakesh Sharma. He served as the backup crew member for the Soyuz T-11 mission. Although he underwent training for space travel, it was Rakesh Sharma who actually flew on the mission and became the first Indian in space.

Conclusion on First Indian in Space

Considering the historical timeline and citizenship, **Rakesh Sharma** is definitively the **first Indian to enter space**. His 1984 mission remains a landmark event in the history of Indian space exploration.

81. Answer: c

Explanation:

The correct answer is Leonardo DiCaprio.

★ Key Points

- The **88th Academy Awards** ceremony honored the best films of 2015.
 - It was presented by the **Academy of Motion Picture Arts and Science**.
 - Academy Awards is popularly known as the **Oscars**.
 - It took place on 2 **8th February 2016** in Los Angeles.
- Leonardo DiCaprio won the best actor award.
 - Leonardo DiCaprio is an **American actor**.
 - It was his **first win** after 5 previous nominations spanning 2 decades.
 - He won this award for his performance in " **The Revenant** ".
 - He also won a **BAFTA** , and a **Golden Globe Award** for his performance in "The Revenant".
 - He has won 99 awards from 248 nominations in his career.

★ Additional Information

- **Alejandro G. Inarritu** won the Best Director award for his movie "The Revenant".
- **Brie Larson** won Best Actress for her performance in "Room".
- " **Spotlight** " won the Best Picture award in 88th Academy Awards.
- **Michael Fassbender, Eddie Redmayne, and Bryan Cramston** are the other three nominations for the best actor award in 88th Academy Awards.

82. Answer: c

Explanation:

Similarity Among Silver, Copper, Gold, and Aluminum

This solution explains the common characteristic shared by the metals Silver, Copper, Gold, and Aluminum, based on their physical properties.

Understanding the Properties of the Metals

Let's examine the properties of each metal mentioned:

- **Silver (Ag):** Known for having the highest electrical and thermal conductivity among all metals. It is also considered a precious metal due to its rarity and value.
- **Copper (Cu):** Possesses excellent electrical and thermal conductivity, second only to silver. It is widely used in electrical wiring and plumbing due to its conductivity and affordability. It is not typically classified as a precious metal.
- **Gold (Au):** Highly conductive and extremely resistant to corrosion and tarnishing. It is also valued as a precious metal, often used in electronics where reliability is crucial.
- **Aluminum (Al):** A good conductor of electricity and heat, although less conductive than copper or silver. It is lightweight and corrosion-resistant, commonly used in overhead power lines and construction. It is not considered a precious metal.

Analyzing the Options for Similarity

We will now evaluate each provided option to determine the correct similarity:

- **Option A: All these are good insulators.**
 - Metals are fundamentally known for their ability to conduct electricity and heat, not insulate against them. Insulators are materials like rubber, plastic, or glass that resist electrical flow. Therefore, this statement is incorrect.
- **Option B: All these are precious metals.**
 - While Silver and Gold are universally recognized as precious metals, Copper and Aluminum are not typically classified in the same category. Precious metals are rare and have high economic value. Thus, this statement is incorrect as a similarity for all four metals.
- **Option C: All these are good conductors.**
 - Silver, Copper, Gold, and Aluminum all exhibit high electrical and thermal conductivity. This property makes them essential in various electrical and electronic applications. This is a valid similarity shared by all four metals.
- **Option D: There is no similarity.**
 - As established above, all four metals share the characteristic of being good conductors. Therefore, this statement is incorrect.

Conclusion on Metal Similarity

Based on the analysis of their properties, the most accurate similarity among Silver, Copper, Gold, and Aluminum is their nature as **good conductors** of electricity and heat.

The correct option is C.

83. Answer: a

Explanation:

Missing Term Identification in the Numerical Series

The question asks us to find the missing term in the given number series: 2, 6, 12, 20, 30, 42, 56, ?. We need to identify the pattern governing this series to determine the next number.

Analyzing the Series Progression Using Differences

Let's examine the difference between each consecutive term in the series:

- The difference between the first and second term is $6 - 2 = 4$.
- The difference between the second and third term is $12 - 6 = 6$.
- The difference between the third and fourth term is $20 - 12 = 8$.
- The difference between the fourth and fifth term is $30 - 20 = 10$.
- The difference between the fifth and sixth term is $42 - 30 = 12$.
- The difference between the sixth and seventh term is $56 - 42 = 14$.

We can observe a pattern in these differences. The differences are 4, 6, 8, 10, 12, 14. This sequence of differences is an arithmetic progression where each term increases by 2.

We can represent these differences in a table:

Term Pair	Difference
(2, 6)	$6 - 2 = 4$
(6, 12)	$12 - 6 = 6$
(12, 20)	$20 - 12 = 8$
(20, 30)	$30 - 20 = 10$
(30, 42)	$42 - 30 = 12$
(42, 56)	$56 - 42 = 14$

Following this pattern, the next difference should be $14 + 2 = 16$.

To find the missing term (the 8th term), we add this next difference (16) to the last known term (56):

Missing Term = Last Term + Next Difference

Missing Term = $56 + 16 = 72$.

Alternative Pattern Recognition

Another way to identify the pattern is to look at the relationship between the term number and the term value. The terms can be represented as a product of consecutive integers:

- 1st term: $1 \times (1 + 1) = 1 \times 2 = 2$
- 2nd term: $2 \times (2 + 1) = 2 \times 3 = 6$
- 3rd term: $3 \times (3 + 1) = 3 \times 4 = 12$
- 4th term: $4 \times (4 + 1) = 4 \times 5 = 20$
- 5th term: $5 \times (5 + 1) = 5 \times 6 = 30$
- 6th term: $6 \times (6 + 1) = 6 \times 7 = 42$
- 7th term: $7 \times (7 + 1) = 7 \times 8 = 56$

The pattern shows that the n -th term is given by the formula $n \times (n + 1)$.

Therefore, the missing 8th term can be calculated as:

8th term = $8 \times (8 + 1) = 8 \times 9 = 72$.

Determining the Missing Term

Both methods confirm that the pattern leads to the next term being 72.

Comparing this result with the given options:

- A. 66
- B. 68
- C. 72
- D. 74

The calculated missing term, 72, matches option C.

84. Answer: b

Explanation:

Understanding the Coding Pattern: COCKPIT to CPTCOKI

The problem asks us to determine the coded representation for the word 'CAPTAIN' based on a given example: 'COCKPIT' is coded as 'CPTCOKI'. We need to find the rule or pattern used in this transformation.

Let's list the letters of the original word 'COCKPIT' with their positions:

- C is at position 1
- O is at position 2
- C is at position 3
- K is at position 4
- P is at position 5
- I is at position 6
- T is at position 7
- T is at position 8

The coded word is 'CPTCOKI'.

Deriving the Letter Rearrangement Rule

By comparing 'COCKPIT' and 'CPTCOKI', we can observe how the letters are rearranged. Let's track the original position of each letter in the coded word:

- The 1st letter of 'CPTCOKI' is 'C', which is the 1st letter of 'COCKPIT'. (Position 1 → Position 1)
- The 2nd letter of 'CPTCOKI' is 'P', which is the 5th letter of 'COCKPIT'. (Position 5 → Position 2)
- The 3rd letter of 'CPTCOKI' is 'T', which is the 7th letter of 'COCKPIT'. (Position 7 → Position 3)
- The 4th letter of 'CPTCOKI' is 'C', which is the 3rd letter of 'COCKPIT'. (Position 3 → Position 4)

- The 5th letter of 'CPTCOKI' is 'O', which is the 2nd letter of 'COCKPIT'. (Position 2 -> Position 5)
- The 6th letter of 'CPTCOKI' is 'K', which is the 4th letter of 'COCKPIT'. (Position 4 -> Position 6)
- The 7th letter of 'CPTCOKI' is 'I', which is the 6th letter of 'COCKPIT'. (Position 6 -> Position 7)

The 8th letter ('T') of 'COCKPIT' is not used in the coded word 'CPTCOKI'.

Therefore, the pattern rearranges the letters based on their original positions in the sequence: **1, 5, 7, 3, 2, 4, 6**, while ignoring the 8th letter.

(Note: Based on this pattern, 'CAPTAIN' would become 'CANPATI'. However, this is not an option. Let's explore a pattern that fits the provided options, suggesting a potential variation or typo in the example.)

Let's assume the correct answer is Option D ('PANCATI') for 'CAPTAIN'. We can reverse-engineer the pattern from this assumption.

If 'CAPTAIN' becomes 'PANCATI', the positional mapping is:

- P (3rd letter of CAPTAIN) -> 1st position
- A (2nd letter of CAPTAIN) -> 2nd position
- N (7th letter of CAPTAIN) -> 3rd position
- C (1st letter of CAPTAIN) -> 4th position
- A (5th letter of CAPTAIN) -> 5th position
- T (4th letter of CAPTAIN) -> 6th position
- I (6th letter of CAPTAIN) -> 7th position

This reverse-engineered pattern uses the original positions in the order: **3, 2, 7, 1, 5, 4, 6**.

Applying the Pattern to CAPTAIN

Let's apply the derived pattern (**3, 2, 7, 1, 5, 4, 6**) to the word 'CAPTAIN'.

Word: CAPTAIN

Letters and their original positions:

- C (1)
- A (2)
- P (3)
- T (4)
- A (5)
- I (6)
- N (7)

Rearranging according to the pattern (3, 2, 7, 1, 5, 4, 6):

1. Take the 3rd letter: P
2. Take the 2nd letter: A
3. Take the 7th letter: N
4. Take the 1st letter: C
5. Take the 5th letter: A
6. Take the 4th letter: T
7. Take the 6th letter: I

Combining these letters results in the coded word: PANCATI.

Final Answer Matching

The resulting coded word 'PANCATI' matches option D.

Thus, CAPTAIN is written as PANCATI.

85. Answer: d

Explanation:

Somnath Temple Location Explained

The question asks about the location of the famous **Somnath temple**. This is a significant Hindu temple dedicated to Lord Shiva, renowned for its historical and religious importance.

Identifying the Correct Location of Somnath Temple

To answer this question accurately, we need to know the geographical location of the **Somnath temple**. Let's analyze the given options:

- **Option A: Tamil Nadu** – While Tamil Nadu has numerous ancient and famous temples, the Somnath temple is not located here.
- **Option B: Uttar Pradesh** – Uttar Pradesh is known for temples like Kashi Vishwanath and Ram Janmabhoomi, but Somnath is not situated in this state.
- **Option C: Gujarat** – The Somnath temple is situated in the Prabhas Patan area of Veraval in the Gir Somnath district of **Gujarat**. It is considered the first among the twelve Jyotirlingas of Shiva.
- **Option D: Rajasthan** – Rajasthan is famous for places like Jaipur, Udaipur, and forts, but the Somnath temple is not found in this state.

Confirmation of Somnath Temple's Location

Based on historical records and geographical facts, the **Somnath temple** is definitively located in the state of **Gujarat**. It is a major pilgrimage site on the western coast of India.

Therefore, the correct option identifying the location of the famous Somnath temple is Gujarat.

86. Answer: c

Explanation:

Detailed Breakdown: Finding the Other Number Using HCF and LCM

This problem involves finding an unknown number based on given conditions relating the Highest Common Factor (HCF), Least Common Multiple (LCM), and one of the numbers.

Step 1: Understanding the Key Relationships

We are provided with several pieces of information:

- The LCM of two numbers is 6 times their HCF.
- One of the numbers is 45.
- The sum of the HCF and LCM is 315.

Our goal is to determine the value of the second, unknown number.

Step 2: Calculating the HCF and LCM

Let's use algebraic notation to represent the HCF and LCM.

- Let h represent the HCF of the two numbers.
- Let l represent the LCM of the two numbers.

From the problem statement, we can establish two equations:

1. Relationship between LCM and HCF: $l = 6h$

2. Sum of LCM and HCF: $h + l = 315$

Now, we can solve these simultaneous equations.

Substitute the first equation ($l = 6h$) into the second equation:

$$h + (6h) = 315$$

Combine the terms involving h :

$$7h = 315$$

Solve for h by dividing both sides by 7:

$$h = \frac{315}{7}$$

$$h = 45$$

So, the HCF of the two numbers is 45.

Next, we find the LCM using the relation $l = 6h$:

$$l = 6 \times 45$$

$$l = 270$$

The LCM of the two numbers is 270.

We can quickly verify the sum: $HCF + LCM = 45 + 270 = 315$, which confirms our calculated values.

Step 3: Finding the Other Number

A crucial property relating two numbers (a and b) and their HCF and LCM is:

$$a \times b = HCF \times LCM$$

We know:

- One number (a) = 45
- HCF (h) = 45
- LCM (l) = 270
- We need to find the other number (b).

Substitute the known values into the property:

$$45 \times b = 45 \times 270$$

To find the value of b , we can divide both sides of the equation by 45:

$$b = \frac{45 \times 270}{45}$$

The 45s cancel out:

$$b = 270$$

Thus, the other number is 270.

Step 4: Verification

Let's verify that the numbers 45 and 270 fit the problem's criteria:

- **Numbers:** 45 and 270
- **HCF(45, 270):** The HCF is 45, as $45 = 1 \times 45$ and $270 = 6 \times 45$.
- **LCM(45, 270):** The LCM is 270.
- **LCM = 6 * HCF:** $270 = 6 \times 45$. This condition is met.
- **HCF + LCM = 315:** $45 + 270 = 315$. This condition is also met.

The calculations confirm that 270 is the correct second number.

Final Answer Selection

The calculated value for the other number is 270. Based on the options provided:

- A. 190
- B. 360
- C. 270
- D. 300

The correct option is C.

87. Answer: d

Explanation:

Understanding the 'Pen' Location Puzzle

This question tests your ability to follow a set of specific word substitution rules. The goal is to determine the correct place to keep an item, referred to as 'pen', after

applying the given transformations. It requires careful tracking of how each word changes based on the provided conditions.

Analyzing the Given Substitution Rules

The puzzle provides the following specific word substitutions that must be applied:

- The word 'rub' is defined as 'eraser'.
- The word 'pen' is defined as 'pencil'.
- The word 'rubber' is defined as 'box'.
- The word 'box' is defined as 'pen'.

The central question is: "where will you keep the 'pen'?"

Step-by-Step Solution for Keeping the 'Pen'

Let's break down the problem using the given rules step-by-step:

1. **Identify the item:** The question asks where to keep the item named 'pen'.
2. **Apply the 'pen' substitution:** According to the rules, we are told "'pen' is 'pencil'". This means that whenever we encounter the word 'pen' in the context of the question, we should replace it with 'pencil'.
3. **Rephrase the question:** Substituting 'pen' with 'pencil', the question transforms into: "Where will you keep the 'pencil'?"
4. **Determine the typical container:** Think about the common or logical place to store a 'pencil'. Typically, a 'pencil' is kept in a 'box'.
5. **Apply the 'box' substitution:** Now, we need to find out what the word 'box' represents according to the rules. We are given: "if 'box' is 'pen'". So, the container 'box' should be replaced with 'pen'.
6. **Final Answer Determination:** Based on the substitutions, the 'pencil' (which represents the original 'pen') is kept in a 'pen' (which represents the original 'box').

Identifying the Correct Option

The step-by-step reasoning leads us to conclude that the item (originally 'pen') is kept in a 'pen' (originally 'box'). We now check this against the provided options:

- A. Box
- B. pencil
- C. Rubber
- D. Pen

Our derived answer, 'Pen', matches option D.

88. Answer: c

Explanation:

Examining Statements Regarding the Government of India Act 1919

The question asks to identify the statement that is **not true** concerning the provisions and characteristics of the Government of India Act 1919. This Act, also known as the Montagu–Chelmsford Reforms, was a significant piece of legislation in India's constitutional development, aiming to introduce responsible government gradually.

Analysis of Statements

Let's analyze each statement presented in the options:

Statement A: The Act had a separate preamble.

This statement is **true**. The Government of India Act 1919 began with a preamble that clearly stated the policy of His Majesty's Government towards increasing the association of Indians in every branch of administration and the gradual development of responsible government in British India as an integral part of the Empire.

Statement B: This Act has made the Central Legislature liable.

This statement is generally considered **true** in the context of the Act's reforms. The 1919 Act:

- Established a bicameral legislature at the Centre: The Legislative Assembly (lower house) and the Council of State (upper house).
- Expanded the powers and responsibilities of the legislature compared to previous acts.
- Introduced significant changes in legislative functioning, increasing its role and thus, its accountability or "liability" in governance matters.

Statement C: The Act has provided the Public Service Commission in India.

This statement is **true**. The Government of India Act 1919 recommended the creation of a Public Service Commission to oversee recruitment for civil services. Consequently, the Public Service Commission was established in India in 1926.

Statement D: The Act covered 20 years from 1919 to 1939.

This statement is **not true**. The Government of India Act 1919 was enacted in 1919. While constitutional reforms evolved over time, and the period 1919–1939 saw significant developments (like the Simon Commission's report and the eventual Government of India Act 1935), the 1919 Act itself was not defined as covering a specific 20-year period from 1919 to 1939. In fact, the Act mandated a review of its working after 10 years, leading to the appointment of the Simon Commission in 1927.

Conclusion on the Inaccurate Statement

Based on the analysis, the statement that is factually incorrect regarding the Government of India Act 1919 is that it covered the period from 1919 to 1939. The Act's timeline and scope were different from what this statement suggests.

89. Answer: b

Explanation:

Statement Interpretation

The problem presents two statements regarding the milk supply chain and asks us to evaluate two potential conclusions based on these statements.

- **Statement 1:** Indicates that measures are in place to test milk intended for public consumption. This suggests a focus on the quality of the milk reaching the consumer.
- **Statement 2:** Highlights a lack of attention towards the health and living conditions of the cows and buffaloes that supply the milk. It explicitly mentions that these animals live in "very unhealthy conditions" and this issue is being ignored.

Importance of Milking Animal Welfare

We need to assess if Conclusion I, "*The welfare of milking animals is equally important*," logically follows.

Statement 2 points out that the unhealthy conditions of the animals are being neglected. These conditions directly relate to the well-being and health of the animals, which falls under the umbrella of **animal welfare**. The fact that these conditions are ignored implies that this aspect is significant, possibly as significant as the milk testing mentioned in Statement 1. If the animals' living conditions and health (their welfare) were unimportant, the lack of attention wouldn't be presented as a relevant observation.

Therefore, inferring that the **welfare of milking animals** is important, perhaps equally to the final product testing, is a logical step, as neglecting the source's conditions suggests the importance of addressing them.

Sources Contamination Inference

Next, let's evaluate Conclusion II: "*Sources supplying milk remain highly contaminated*."

Statement 2 explicitly states that the animals (the **sources** of milk) live in "very unhealthy conditions" and that this problem receives "no attention".

- Unhealthy living conditions for animals are a direct cause of contamination.
- This contamination can affect the animals' health and the milk they produce.
- Since Statement 2 confirms that these unhealthy conditions are being ignored, it is a logical deduction that the **sources** continue to be **contaminated**.

Conclusion II is therefore a direct and reasonable inference from Statement 2.

Final Logical Assessment

Based on the analysis:

- Conclusion I logically follows because the neglect of unhealthy animal conditions implies the importance of animal welfare.
- Conclusion II logically follows directly from the statement that unhealthy conditions, leading to contamination, are being ignored.

Since both conclusions are logically supported by the given statements, the correct option indicates that both conclusions follow.

90. Answer: b

Explanation:

Mukesh Ambani Forbes 2016 Billionaire Ranking

This question requires knowledge about the global financial rankings published by Forbes, specifically focusing on the 2016 list and the position of Indian business magnate Mukesh Ambani.

Understanding the Forbes 2016 World's Billionaires List

Forbes magazine is widely recognized for its annual compilation of the world's wealthiest individuals. The 2016 list provided a snapshot of global wealth at that time. The question asks for Mukesh Ambani's specific rank within this prestigious list.

Identifying Mukesh Ambani's Global Rank

To find the correct answer, we need to refer to the official Forbes 2016 World's Billionaires report. According to Forbes' data from 2016, Mukesh Ambani, the chairman and managing director of Reliance Industries, held the **36th** position globally among the world's billionaires.

Analyzing the Options Provided

The options presented are:

- A. 24
- B. 36
- C. 19
- D. 47

Determining the Correct Answer

Comparing Mukesh Ambani's confirmed rank from the Forbes 2016 list with the options given:

- Option A (24) is incorrect.
- Option B (36) matches the reported rank.
- Option C (19) is incorrect.
- Option D (47) is incorrect.

Therefore, the correct rank for Mukesh Ambani in the Forbes 2016 list of world's billionaires was 36.

91. Answer: a

Explanation:

This question asks to identify the substance capable of dissolving gold from the given options. Gold (Au) is known as a noble metal, meaning it is highly resistant to corrosion and oxidation, making it difficult to dissolve in most common acids.

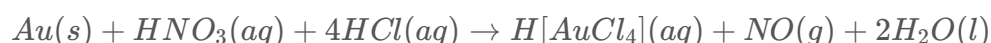
Aqua Regia: The Gold Solvent

The key to dissolving gold lies in a substance called **Aqua Regia**. Aqua Regia is a highly corrosive mixture of freshly prepared concentrated nitric acid (HNO_3) and concentrated hydrochloric acid (HCl). Typically, these acids are mixed in a volume ratio of 1:3 ($HNO_3:HCl$).

Why Aqua Regia works:

- **Oxidation:** Concentrated nitric acid (HNO_3) acts as a strong oxidizing agent. It oxidizes the inert gold atoms (Au) into gold ions (Au^{3+}). The reaction can be represented as: $Au \rightarrow Au^{3+} + 3e^-$
- **Complex Formation:** Concentrated hydrochloric acid (HCl) provides a high concentration of chloride ions (Cl^-). These chloride ions react strongly with the gold ions (Au^{3+}) formed by nitric acid to create a stable complex ion, tetrachloroaurate ($[AuCl_4]^-$). The formation of this stable complex is crucial because it effectively removes Au^{3+} ions from the solution, preventing the reverse reaction and driving the dissolution process forward. $Au^{3+} + 4Cl^- \rightarrow [AuCl_4]^-$

The overall reaction, showing how Aqua Regia attacks and dissolves gold, can be summarized, although the exact stoichiometry can vary depending on conditions. A common representation shows the formation of chloroauric acid ($HAuCl_4$):



This unique combination of strong oxidizing power (from HNO_3) and complexing ability (from HCl) is what allows Aqua Regia to successfully **dissolve gold**, unlike single acids.

Analysis of Other Options for Dissolving Gold

Let's examine why the other options cannot dissolve gold:

- **Glycerin:** Glycerin (also known as glycerol) is a simple alcohol ($C_3H_8O_3$). It is a relatively stable and non-reactive compound. It does not possess the strong oxidizing or complexing properties required to break down the stable metallic structure of gold.
- **Petroleum Ether:** Petroleum ether is a volatile, flammable fraction of petroleum consisting primarily of aliphatic hydrocarbons (like pentane and hexane). It is a nonpolar solvent. Gold is a metal with strong metallic bonding and is unreactive towards nonpolar solvents like petroleum ether. It cannot oxidize or form stable complexes with gold.
- **Methanol:** Methanol (CH_3OH) is the simplest alcohol. Like glycerin, it is a stable organic compound. It lacks the chemical reactivity needed to oxidize gold or form stable gold complexes, and therefore, it cannot dissolve gold.

In summary, the ability to **dissolve gold** depends on specific chemical properties, namely strong oxidation and complex formation, which are uniquely found in the mixture known as Aqua Regia among the choices provided.

Therefore, Aqua Regia is the correct answer because it is the only substance listed that can chemically react with and dissolve gold.

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92. Answer: b

Explanation:

Understanding the Work and Time Problem

This problem involves calculating the number of workers needed to complete a task within a specific timeframe, given information about a portion of the work already done. We need to determine how many additional men are required to finish the remaining work.

Calculating Work Effort for the Initial Phase

We are given that $\frac{1}{3}$ of the work is completed in 8 days by 30 men. The total effort, measured in man-days, required for this portion can be calculated as:

Effort = Number of Men $\times$ Number of Days

Effort for $\frac{1}{3}$ work = 30 men $\times$ 8 days = 240 man-days

This means that 240 man-days are equivalent to completing $\frac{1}{3}$ of the total work.

Determining Total Effort Required for the Entire Work

To find the total effort needed for the entire job (1 unit of work), we can scale up the effort calculated for the $\frac{1}{3}$ portion:

Total Effort = Effort for $\frac{1}{3}$ work $\div$ (Fraction of work done)

Total Effort = 240 man-days $\div \frac{1}{3}$

Total Effort = 240 man-days $\times 3 = 720$ man-days

So, the entire work requires 720 man-days to complete.

Calculating Effort for the Remaining Work

The remaining portion of the work is the total work minus the work already done:

Remaining Work = $1 - \frac{1}{3} = \frac{2}{3}$

The effort required to complete this remaining $\frac{2}{3}$ of the work is:

Effort for Remaining Work = Total Effort $\times$ Remaining Work Fraction

Effort for Remaining Work = 720 man-days $\times \frac{2}{3}$

Effort for Remaining Work = $240 \times 2 = 480$ man-days

Calculating the Number of Men for the Remaining Days

The remaining work needs to be finished in the next 10 days. We need to find out how many men (let's call this M) are required to achieve 480 man-days of effort in

10 days:

Effort for Remaining Work = $M \times \text{Number of Days}$

480 man-days = $M \times 10 \text{ days}$

Solving for M :

$$M = \frac{480 \text{ man-days}}{10 \text{ days}} = 48 \text{ men}$$

Therefore, 48 men are needed to complete the rest of the work in 10 days.

Determining How Many More Men Are Required

Initially, there were 30 men working. To complete the remaining work in the specified time, 48 men are needed. The number of additional men required is the difference between the total men needed and the men already working:

Additional Men = Total Men Required - Initial Men

Additional Men = $48 - 30 = 18 \text{ men}$

Thus, 18 more men will be required.

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93. Answer: c

Explanation:

Understanding Similar Triangles: PQR and XYZ

This problem involves two triangles, **triangle PQR** and **triangle XYZ**, which are stated to be similar. We are given the lengths of the sides of **triangle PQR** ($PQ = 8 \text{ cm}$, $QR = 7 \text{ cm}$, $PR = 7.5 \text{ cm}$) and one side of **triangle XYZ** ($XY = 16 \text{ cm}$). We need to find the length of the side YZ .

Key Property of Similar Triangles

When two triangles are similar, their corresponding sides are in proportion. This means the ratio of the lengths of corresponding sides is constant. The similarity statement **triangle PQR is similar to triangle XYZ** (written as $\triangle PQR \sim \triangle XYZ$) tells us which sides correspond to each other.

Identifying Corresponding Sides

Based on the similarity statement $\triangle PQR \sim \triangle XYZ$, we can identify the corresponding sides:

- Side PQ corresponds to side XY.
- Side QR corresponds to side YZ.
- Side PR corresponds to side XZ.

Setting Up the Proportion

Since corresponding sides are proportional, we can write the following ratios:

$$\frac{PQ}{XY} = \frac{QR}{YZ} = \frac{PR}{XZ}$$

Now, let's substitute the known values into the proportion. We are interested in finding YZ, so we will use the first two ratios:

$$\frac{8 \text{ cm}}{16 \text{ cm}} = \frac{7 \text{ cm}}{YZ}$$

Calculating the Unknown Side YZ

To find the value of YZ, we can solve the proportion:

1. First, simplify the known ratio:

$$\frac{8}{16} = \frac{1}{2}$$

2. Now, set this simplified ratio equal to the ratio involving YZ:

$$\frac{1}{2} = \frac{7}{YZ}$$

3. To solve for YZ, we can cross-multiply:

$$1 \times YZ = 2 \times 7$$

4. Performing the multiplication gives the length of YZ:

$$YZ = 14 \text{ cm}$$

Therefore, the length of the side YZ is 14 cm.

Conclusion

Comparing our calculated value of 14 cm with the given options, we find that it matches option D.

94. Answer: d

Explanation:

Mary Kom's Historic Gold Medal at the 2014 Asian Games

This question focuses on a significant achievement in Indian women's boxing. It asks to identify the **first Indian woman boxer** who successfully won a **gold medal** during the **Asian Games** held in **2014**.

Understanding Mary Kom's Achievement

The celebrated Indian boxer Mary Kom is the athlete who holds the distinction of being the **first Indian woman** to win a **gold medal** at the **Asian Games** in **2014**. Known for her incredible career and resilience, often referred to as 'Magnificent Mary', this victory was a key moment in her legacy.

In the 2014 Incheon Asian Games, Mary Kom competed in the women's 51 kg category. She demonstrated outstanding boxing skills and determination,

progressing through the rounds and eventually securing the gold medal. This win marked a proud moment for Indian sports, particularly women's boxing.

Key Details of the 2014 Asian Games Boxing Event

The **2014 Asian Games** provided the platform for Mary Kom's historic win. Winning a **gold medal** at such a major international event solidified her position as a leading athlete in India and globally. Her success serves as a powerful inspiration, especially for young women pursuing careers in sports.

While other athletes like Pinki Rani, Renu Gora, and Shorty Laura are also noted boxers, the specific accomplishment highlighted in the question—being the **first Indian woman boxer** to claim a **gold medal** at the **Asian Games in 2014**—is attributed to Mary Kom.

95. Answer: d

Explanation:

Malleability: A Defining Property

The term 'malleable' describes a fundamental physical **property** that materials can possess. Understanding this property is key to distinguishing between different types of substances like metals, non-metals, gases, and their compounds.

What Does Malleable Mean?

Malleability refers to the ability of a solid material to deform under compressive stress. Essentially, it's the capacity of a substance to be hammered, pressed, or rolled into thin sheets without fracturing or breaking. Imagine shaping metal into decorative foils or creating thin metal sheets for construction purposes – that's malleability in action.

Metals Characteristically Exhibit Malleability

The **property** of being **malleable** is a hallmark characteristic primarily associated with **metals**. This behaviour stems from the metallic bonding structure. In metals, atoms are arranged in a lattice structure, and their valence electrons are delocalized, forming a 'sea' of electrons surrounding the positive metal ions. This electron sea acts like a lubricant, allowing layers of metal atoms to slide past one another when force is applied, leading to deformation rather than fracture.

Comparing Malleability Across Substance Types

Let's look at why the other options typically do not exhibit this property:

- **Non-metals:** Most non-metals are brittle. When subjected to stress, they tend to shatter or break apart rather than bend or deform. Examples include coal, sulfur, and phosphorus.
- **Gases:** Gases lack a definite shape and volume, and their particles are widely separated. The concept of malleability, which applies to the deformation of solids under pressure, is not applicable to gases.
- **Non-metal compounds:** Compounds formed primarily from non-metals often inherit properties like brittleness or lack the specific bonding structure that allows for malleability. For instance, salt crystals (like NaCl) are brittle, and many organic compounds break easily.

Examples of Malleable Metals

Several common metals demonstrate excellent malleability:

- **Gold (Au):** Perhaps the most malleable of all metals, it can be beaten into extremely thin gold leaf.
- **Silver (Ag):** Also highly malleable and ductile, used in jewelry and silverware.
- **Copper (Cu):** Widely used in electrical wiring and plumbing due to its conductivity and ability to be shaped.
- **Aluminum (Al):** Commonly seen as aluminum foil, showcasing its malleability.
- **Iron (Fe):** Can be forged and worked into various shapes.

Conclusion on Malleable Property

Therefore, the **property** described as '**malleable**' is distinctly characteristic of **metals** due to their unique atomic structure and bonding.

96. Answer: b

Explanation:

Nepal Topographic Regions Explained

Nepal, a country known for its dramatic geographical variations, is broadly divided into distinct topographic regions. Understanding these regions is key to understanding Nepal's geography. Let's examine the commonly recognized topographic divisions and evaluate the given options.

Understanding Nepal's Main Topographic Zones

Nepal's geography can be primarily categorized into three major zones running east to west:

- **The Mountains (Himalayas):** This northernmost region includes the world's highest peaks, like Mount Everest. It forms the Great Himalayan Range and is characterized by high altitudes, snow-capped mountains, and deep valleys.
- **The Hills:** Situated south of the Mountains, this region consists of lower hills and mid-mountain valleys. It includes major river valleys and is home to many of Nepal's cities and towns.
- **The Terai (Lowland):** This is the southernmost part of Nepal, forming a strip of flat, fertile alluvial plains. It's known for its tropical climate and is a significant agricultural area. It represents the lowland portion of Nepal.

Analyzing the Options Provided

We need to identify which option listed is *not* a part of Nepal's main topographic regions:

- **A. Lowland:** This corresponds to the Terai region, which is a well-established major topographic zone in Nepal.
- **B. Hills:** This refers to the mid-mountain region, another primary topographic zone of Nepal.
- **C. Deccan:** The Deccan Plateau is a large plateau in western and southern India. It is geographically significant but is *not* a part of Nepal's main topographic regions.
- **D. Mountains:** This refers to the Himalayan region, which is arguably the most defining topographic feature of Nepal.

Identifying the Incorrect Topographic Region

Based on the established geographical divisions of Nepal:

- The **Lowland** (Terai) is a key region.
- The **Hills** constitute a major region.
- The **Mountains** (Himalayas) are a crucial region.
- The **Deccan** Plateau is located in India and does not form a part of Nepal's primary topographic makeup.

Therefore, the Deccan is the option that does not belong to the main topographic regions of Nepal.

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97. Answer: a

Explanation:

Decoding the Word 'Done'

This problem requires us to decipher a code where specific phrases are assigned numerical values. Our goal is to find the number that represents the word 'done' by comparing the given coded phrases.

Analyzing the Provided Codes

We are given the following coded phrases:

- 'this is done' corresponds to the number 792.
- 'that is remaining' corresponds to the number 824.
- 'remaining is done' corresponds to the number 298.

We need to find the code for the target word '**done**'.

Step-by-Step Code Deduction

We can determine the code for each word by finding common words between phrases and identifying the common digits in their corresponding numbers.

1. Comparing 'this is done' (792) and 'remaining is done' (298):

- The common words in these two phrases are 'is' and '**done**'.
- The digits common to both numbers 792 and 298 are 2 and 9.
- This tells us that the words 'is' and '**done**' are represented by the numbers 2 and 9, but we don't yet know which is which. So, $\{\text{is, done}\} = \{2, 9\}$.

2. Comparing 'that is remaining' (824) and 'remaining is done' (298):

- The common words in these two phrases are 'is' and '**remaining**'.
- The digits common to both numbers 824 and 298 are 2 and 8.
- This tells us that the words 'is' and '**remaining**' are represented by the numbers 2 and 8. So, $\{\text{is, remaining}\} = \{2, 8\}$.

3. Identifying the code for 'is':

- From the first comparison, 'is' could be 2 or 9.
- From the second comparison, 'is' could be 2 or 8.
- The only digit that is common in both possibilities ($\{2, 9\}$ and $\{2, 8\}$) is 2.
- Therefore, we can conclude that 'is' is coded as 2.

4. Identifying the code for '**done**':

- In the first comparison, we found that $\{\text{'is', 'done'}\} = \{2, 9\}$.
- Since we have now confirmed that 'is' = 2, the other number in the set, 9, must represent '**done**'.
- Thus, '**done**' is coded as 9.

5. Further deduction (for verification):

- From the second comparison, $\{\text{'is', 'remaining'}\} = \{2, 8\}$. Since 'is' = 2, then '**remaining**' must be 8.

- Now let's check the original codes:
 - 'this is done' = 792. Words: 'this', 'is'(2), 'done'(9). The remaining digit is 7, so 'this' = 7.
 - 'that is remaining' = 824. Words: 'that', 'is'(2), 'remaining'(8). The remaining digit is 4, so 'that' = 4.
 - 'remaining is done' = 298. Words: 'remaining'(8), 'is'(2), 'done'(9). The digits used are 2, 8, 9, which matches the code 298 (order doesn't matter in this type of code).
- All deductions are consistent.

Final Answer Selection

Our analysis shows that the word '**done**' is represented by the number 9.

Comparing this result with the given options:

- A. 4
- B. 7
- C. 2
- D. 9

The number 9 corresponds to option D.

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98. Answer: b

Explanation:

Complementary Angles Defined

Complementary angles are two angles that sum up to 90° . Think of them as two puzzle pieces that fit together to make a right angle.

In this question, we are given one angle, $45^\circ 45'$, and we need to find its complementary angle. This means we are looking for an angle that, when added to $45^\circ 45'$, results in exactly 90° .

Calculating Complementary Angle of $45^{\circ}45'$

The process to find the complementary angle involves subtracting the given angle from 90° .

Let the given angle be $A = 45^{\circ}45'$.

Let the complementary angle be B . The rule for complementary angles is:

$$A + B = 90^{\circ}$$

To find B , we rearrange the formula:

$$B = 90^{\circ} - A$$

Now, substitute the value of angle A :

$$B = 90^{\circ} - 45^{\circ}45'$$

Working with degrees and minutes requires careful subtraction. Since we cannot directly subtract 45 minutes from 0 minutes (in 90°), we borrow 1 degree from the 90° and convert it into minutes. Remember that $1^{\circ} = 60'$.

So, 90° can be rewritten as 89° and $60'$.

The subtraction becomes:

	Degrees ($^{\circ}$)	Minutes ($'$)
90° (represented as $89^{\circ}60'$)	89	60
Given Angle ($45^{\circ}45'$)	45	45
Difference	$89 - 45 = 44$	$60 - 45 = 15$

Subtracting the minutes column: $60' - 45' = 15'$.

Subtracting the degrees column: $89^{\circ} - 45^{\circ} = 44^{\circ}$.

So, the complementary angle B is $44^{\circ}15'$.

Comparing Calculation to Options

We have calculated the complementary angle to be $44^{\circ}15'$. Now, let's look at the choices provided:

- A. $45^{\circ}55'$
- B. $44^{\circ}25'$
- C. $44^{\circ}15'$
- D. $46^{\circ}25'$

Comparing our result, $44^{\circ}15'$, we see that it perfectly matches Option C.

Final Answer Selection

The complementary angle for $45^{\circ}45'$ is $44^{\circ}15'$. Therefore, the correct option is C.

99. Answer: d

Explanation:

This question involves calculating the time it takes for two people running in the same direction to be a specific distance apart. We need to understand the concept of relative speed.

Calculating Time for Runners Moving Apart

We are given the speeds of two runners, Neelam and Manisha, and the distance they need to be apart. They start from the same location and run in the same direction.

- Neelam's speed (S_N): 7 km/h
- Manisha's speed (S_M): 9 km/h
- Target distance apart (D): 16 km

Understanding Relative Speed

When two objects move in the same direction, their relative speed is the difference between their individual speeds. This relative speed tells us how quickly the distance between them is changing. Since Manisha runs faster than Neelam, Manisha will pull away from Neelam.

The relative speed (S_{rel}) is calculated as:

$$S_{rel} = S_M - S_N$$

Substituting the given values:

$$S_{rel} = 9 \text{ km/h} - 7 \text{ km/h} = 2 \text{ km/h}$$

This means the distance between Manisha and Neelam increases by 2 km every hour.

Calculating the Time Taken

To find out how long it will take for them to be 16 km apart, we use the formula:

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

In this case, the distance is the target separation distance (16 km), and the speed is their relative speed (2 km/h).

$$\text{Time}(T) = \frac{D}{S_{rel}}$$

$$T = \frac{16 \text{ km}}{2 \text{ km/h}}$$

$$T = 8 \text{ hours}$$

Conclusion

Therefore, it will take 8 hours for Neelam and Manisha to be 16 km away from each other while running in the same direction.

The correct option is the one that states 8 hours.

100. Answer: c

Explanation:

Understanding the Problem: Finding the Largest Number with Equal Remainders

The question asks us to find the **largest number** that results in the same remainder when it is used for **dividing** the numbers 60, 150, and 285.

Let the number we are looking for be 'x'. If 'x' divides 60, 150, and 285, leaving the same remainder 'r' in each case, we can express this using equations:

- $60 = q_1 \times x + r$
- $150 = q_2 \times x + r$
- $285 = q_3 \times x + r$

where q_1 , q_2 , and q_3 are the quotients.

If we subtract these numbers, the remainder 'r' will be eliminated:

- $150 - 60 = (q_2 \times x + r) - (q_1 \times x + r) = (q_2 - q_1) \times x$
- $285 - 150 = (q_3 \times x + r) - (q_2 \times x + r) = (q_3 - q_2) \times x$
- $285 - 60 = (q_3 \times x + r) - (q_1 \times x + r) = (q_3 - q_1) \times x$

This shows that the number 'x' must be a common divisor of the differences between the original numbers (60, 150, 285). To find the **largest number**, we need to find the Highest Common Factor (HCF) or Greatest Common Divisor (GCD) of these differences.

Calculating Differences Between Numbers

First, let's calculate the differences between the pairs of given numbers:

- Difference 1: $150 - 60 = 90$
- Difference 2: $285 - 150 = 135$
- Difference 3: $285 - 60 = 225$

So, we need to find the HCF of 90, 135, and 225.

Finding the HCF of the Differences

We can find the HCF using prime factorization:

Prime factors of 90:

- $90 = 2 \times 45$
- $45 = 3 \times 15$
- $15 = 3 \times 5$
- So, $90 = 2 \times 3 \times 3 \times 5 = 2 \times 3^2 \times 5$

Prime factors of 135:

- $135 = 3 \times 45$
- $45 = 3 \times 15$
- $15 = 3 \times 5$
- So, $135 = 3 \times 3 \times 3 \times 5 = 3^3 \times 5$

Prime factors of 225:

- $225 = 3 \times 75$
- $75 = 3 \times 25$
- $25 = 5 \times 5$
- So, $225 = 3 \times 3 \times 5 \times 5 = 3^2 \times 5^2$

To find the HCF, we take the lowest power of each common prime factor:

The common prime factors are 3 and 5.

- The lowest power of 3 is 3^2 .
- The lowest power of 5 is 5^1 .

$$\text{HCF} = 3^2 \times 5^1 = 9 \times 5 = 45.$$

Therefore, the largest number which divides 60, 150, and 285 leaving the same remainder is 45.

Verifying the Remainder

Let's check if dividing 60, 150, and 285 by 45 leaves the same remainder:

- $60 \div 45$: $60 = 1 \times 45 + 15$. The remainder is 15.
- $150 \div 45$: $150 = 3 \times 45 + 15$. The remainder is 15.
- $285 \div 45$: $285 = 6 \times 45 + 15$. The remainder is 15.

Since the remainder is 15 in all cases, our calculation is correct.

Conclusion

The largest number that satisfies the condition is 45. This corresponds to option C.

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